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HAVANA, CUBA

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PRESIDENT'S ADDRESS

BY DR. CARLOS J. FINLAY,

HEALTH OFFICER FOR CUBA, HAVANA, CUBA.

Members of the American Public Health Association, Ladies and Gentlemen:

To the great honor that has been tendered to me in electing me president at our last annual meeting do I owe the privilege of bidding you welcome to Cuban shores and to this city of Havana which has so many reasons for being grateful to the American Public Health Association, some of whose members rank among its greatest benefactors.

Lest this statement should be considered a mere compliment, I beg leave to recall the following historical facts.

A quarter of a century ago, a group of American scientists, one of whom was a native of Cuba, constituting the first Havana yellow fever commission, came from Washington to reconnoitre and prepare the ground upon which a common enemy would be subsequently challenged and decisive battles fought. This enemy was the yellow fever; and so well did this preparatory commission accomplish its object, that I can readily trace back to its immediate influence the discoveries which led the way to ultimate success. The chairman of the commission was Professor Stanford E. Chaillé, and the other members were Dr. George M. Sternberg, Dr. John Guiteras, and Mr. Hardee, civil engineer.

Twenty years later, another "Havana Yellow Fever Commission" was sent from Washington by the Surgeon General of the U. S. Army, Dr. George M. Sternberg, for the purpose of submitting to a final and decisive test the validity of claims set forth by some investigators as to having discovered the true etiology of yellow fever. The members of this second commission were men willing and ready to risk their lives in the enterprise, thoroughly trained and perfectly equipped for the occasion. One of them, Dr. James Carroll, started as a forlorn hope to face the gravest peril, and within the normal period of incubation he lay prostrate with a severe attack of the disease which he had courted. Another member, Dr. Jesse Lazear, while visiting a yellow fever ward and fully aware of the risk that he was taking, allowed a mosquito, presumedly contaminated, to accomplish unmolested upon his bare wrist its fatal function. He was attacked five days later with the disease, in its worst form, and may be said to have died, like

Latour d'Auvergne, *au champ d'honneur,* a martyr to his scientific zeal. Their leader, Major Walter Reed, whose scientific attainments, keen acumen and strategy had enabled him to accomplish the most perfect demonstration of scientific truth ever recorded in that field of investigation, died the following year after his great triumph, mourned not only by his friends and countrymen but by humanity which he had served so well. Dr. Aristides Agramonte, being a native of Cuba and immune, was spared the trials of his co-workers.

Finally, Major (now Colonel) W. C. Gorgas, as chief health officer in Cuba under General Wood's government, by abandoning his former tactics and adopting new ones in accordance with the findings of the commission, succeeded in ridding Havana of its inveterate enemy in the space of seven months.

The names which I have cited in the above narrative are all familiar to you as having figured on the rolls of the Association, and the city of Havana, in which every detail of the investigation was carried out, has been the first to benefit by its splendid results. What more appropriate place, therefore, or fitter occasion could you have chosen for this annual meeting, than the scene of such great triumphs and the contemplation of the happy fruit of victories achieved.

Yet other attractions beside personal sentiment will, I trust, reconcile you to the temporary privation of home comforts and luxuries which you may have left behind in your sumptuous cities of the North. The novelty of a winter without frost or snow, the constant verdure and blossoms in our landscapes, the royal palm which marks the border-line of the tropics, will be pleasant surprises to many; while the hearty sympathy of our Cuban physicians with the noble objectives pursued by the American Public Health Association will be a bond of union and a token of future good fellowship between you all and this young but enterprising Republic of Cuba.

Our regular members as well as the delegates and visitors who honor us this evening with their company will probably be interested to know how far Havana has succeeded in maintaining, since last year, its defence against infectious diseases and to grapple with the sanitary problems for the study of which special committees were appointed at our previous annual meeting. But before entering upon this subject it is my painful duty to notify to our members the bereavement suffered by the Association of several of its cherished associates during the year of my presidency.

Dr. Robert Wood Mitchell, died in New Orleans, La.

Dr. R. D. Murray, the veteran and efficient sanitarian of the South, of yellow fever renown, died in Key West, Fla.

Dr. C. C. Wyckoff, died at Buffalo, N. Y.
Arthur William Palmer, died at Champaign, Ill.
Dr. E. A. de Schweinitz, died in Washington, D. C.
Dr. Franklin Staples, died at Winona, Minn.
Dr. R. S. Goodwin, died at Thomaston, Ct.
Dr. Moreau Morris, died at New York, N. Y.
Dr. W. L. Buechner, died at Youngstown, O.
Reuben Shirreffs, C. E., died at Richmond, Virginia.
Dr. Thomas M. Drown, died at South Bethlehem, Pa.
Dr. Arthur S. Wolff, died at Brownsville, Texas.
Dr. Samuel W. Abbott, died at Boston, Mass.

Their names will be recorded upon the roll of honor of the Association as well as in the memory of all its members.

Dr. Samuel Warren Abbott, held during 18 years the important post of Secretary in the Massachusetts State Board of Health. He was a member of several scientific societies in America and of the Royal Statistical Society of Great Britain. Being acknowledged as one of the most careful statisticians on medical matters in the United States, his reports were regarded as models, and their style has been copied in many other States.

Dr. de Schweinitz, Chief of the Biochemic Division of the Bureau of Animal Industry in the Department of Agriculture at Washington, D. C., had been engaged in important work with the Association along the line of the investigation of human and bovine tuberculosis. He died on the 15th of February, a great loss to the Bureau and to the Association.

Our sanitary experience in Cuba during the last twelve months both with regard to yellow fever and to smallpox has been somewhat more eventful and at the same time more instructive than in the preceding two years.

In the district of Havana, I am happy to say, notwithstanding the admission of imported cases of yellow fever from foreign ports, not a single case, originating on the Island, has been recorded. At the other end of the Island, however, as you are aware, a case was reported on the 20th of October; this was a non-immune American who was attacked, three weeks after his arrival from New York at Punta de Sal, on the shore of Santiago Bay, at a point near the entrance of the bay six miles distant from the city on the opposite shore. The manner in which the infection may have been introduced lends itself to some rather interesting speculations. A close investigation having failed to discover its source at Punta de Sal at the Cobre mines, or in the city of Santiago, it is presumed that from the deck of some infected vessel held in quarrantine in the bay, a mosquito previously contaminated may have been blown by a gust of wind toward some floating body. After the latter had been stranded by the ebb-tide upon the shore at Punta de Sal, close to the house occupied by the non-immune American, the infected insect may have flown ashore and inoculated the disease to the patient. This surmise must not be considered as an explanation invented for the occasion. As far back as 1891 I suggested a similar explanation as the only one which could plausibly account for the famous case of the "stone-cutter" described in the epidemic of yellow fever at St. Nazaire in 1861. This "stone-cutter" had never left the side of the dock opposite to that on which the infected vessel (the Anne-Marie), at a distance of 225 metres across the water, had been discharging her cargo since the 27th of July. This man, however, had been engaged during those days in repairing the flood gate of the dock while the tide was low, and he was attacked with fatal yellow fever on the 4th of August, two days after the first case had declared itself at St. Nazaire. A similar explanation applies likewise to the epidemic of yellow fever at Governor's Island in 1870, which was reported by our ex-president, now retired surgeon general of the U. S. Army, Dr. Sternberg, who was then entering upon his brilliant career. The only solution which, at the time, could be arrived at to account for the introduction of the poison was the infected matter carried by the ebb-tide from some vessels discharging their cargoes on the Brooklyn side and deposited on a low point of land in the vicinity of which the disease made its appearance.

With the experimental proofs that we now possess as to the fact that fomites *per se* are incapable of transmitting the disease, the inevitable conclusion must be that in the aforesaid instances infected mosquitoes had been conveyed upon floating bodies by the ebb-tide.

(The possibility that mosquitoes may be conveyed upon floating bodies to a considerable distance across the water has been confirmed, at least for the Arctic congeners of our tropical species, by Dr. Paul Gazeau, the accomplished naval surgeon in charge of the Atlantic Division of the French fleet, who visited us only a few days ago. Dr. Gazeau informs us that he has recently forwarded to the well known Parisian parasitologist, Professor Blanchard, a collection of mosquitoes which he had caught alive upon an iceberg which had floated to within 500 metres of the coast of Newfoundland. He does not know how the mosquitoes had got there; but there they were, and might have been conveyed to other regions had the iceberg floated away.

It must be remembered however that the mosquitoes to which Dr. Gazeau refers were large, powerful insects, capable of pursuing their prey, in swarms, in open boats, whereas the yellow fever mosquito, with its short, frail wings and delicate structure, could never accomplish such a feat. A concurrence of exceptional circumstances would therefore be needed in order that yellow fever should be conveyed upon floating bodies, as must also be inferred from the rarity of instances such as have been quoted above.)

A second case of yellow fever, of which you are also aware, developened at Punta de Sal, in a non-immune American who had slept in the same room with the first patient and had taken care of him during the first days of his illness. He was attacked ten days after his friend had been isolated and removed to the lazaretto of Cayo Duan. These two cases are the only ones which, to the best of my knowledge, have developed on this Island since 1901.

The only case of smallpox originated on Cuban soil, since that same year, occurred in the month of June of 1904. A newly engaged employee, at Las Animas Hospital, who had never been vaccinated at all, had managed to elude on two occasions the order issued to the personnel for general vaccination. He contracted a fatal form of the disease 15 days after the admission at that hospital of a case of smallpox imported from Europe.

Taking up the subjects on which our special committees will furnish their reports, allow me to call your attention to those in which Cuban sanitation is more particularly interested.

The question of purification and preservation of water supplies is one which must appeal to many sanitarians in the United States and to a much greater degree on this Island where up-to-date sanitation must be, for some time to come, more of an extemporaneous character than a permanent one. In the city of Havana we are pretty well endowed, in so far that we have good drinking water supplied through the remarkable engineering work accomplished many years ago by a Cuban military engineer, who occupied a high post in the Spanish army, Colonel Albear. But with the growth of the city and the larger demand, a need for better and more copious distribution of it is felt in several parts of the city and in its suburbs. In most of the towns of the interior, however, and so long as unpolluted water cannot be distributed, I do not know that anything better could be provided than the old fashioned system of cisterns in which rain water can be collected in abundance both in public buildings and in private houses, during the summer season, if it were only possible to ensure their being properly attended to. Many of the difficulties attending the supply of unpolluted water would, however, be surmounted if the electrical ozone-generators which are being tried in Europe for the purification of water, are found to give the desired result at a moderate cost.

From the second special committee we are likely to receive valuable information regarding septic tanks and filter beds. We have such a plant at the Hospital of Camagüey, and so far it is working satisfactorily.

I understand that the committee on etiology of yellow fever will not present a report. Our experience of another twelve months of immunity obtained through measures which confirm the doctrine that the disease is exclusively transmitted through the bites of infected mosquitoes, adds nevertheless considerable weight to this negative proof.

The fight against tuberculosis must be maintained at all cost, as the most important factor in mortuary statistics of large towns almost all the world over. But I think that modern experience confirms the consolatory views long entertained by the distinguished specialist Professor Grancher, and so ably expounded in some of his recent publications. They are certainly consolatory, leading to the conclusion that our efforts should be directed toward general sanitation and early diagnosis just as much as or more than toward the minutiae upon which the attention of sanitarians is at present chiefly concentrated. In fact he holds that unmixed tuberculosis, *per se,* tends, as a rule, toward spontaneous cure provided that pure air with salubrious dwellings and surroundings can be secured for the patient at the initial stages of the disease.

On the subject of plague we expect to hear valuable papers from our members from Mexico, where they have been so successful in extinguishing the epidemic last year, thereby deserving our highest praise as well as our gratitude for having prevented its extension to the frontiers and to the Atlantic coast, which would have been a graver menace for all the adjoining nations than any that we have yet had to contend with from that quarter.

The study of causes and prevention of infantile mortality is one which affects Cuba not only with reference to infantile enteritis but also with regard to tetanus neonatorum, the occurrence of which must always be coupled with unpardonable ignorance or neglect both on the part of parents and of the attendants at the birth of children.

The control of milk supplies in large cities is closely connected with the infantile mortality, for the methods best calculated to carry the former into effect should undoubtedly lessen the latter.

Finally, the subject of sanitary agreement between adjoining nations has become of paramount importance since the recent advance made in our knowledge of the etiology of certain quarantinable diseases, of yellow fever in particular. Hence the obvious advisability, that European nations holding possessions in the American yellow fever zone be represented at the meetings of this Association.

We shall miss in the treatment of this subject, the able leadership of the chairman appointed for the committee, our ex-president Dr. Montizambert, and I am sure that all will join me in deepest sympathy for the sad event which deprives us of his presence.

We shall have with us nevertheless other members from Canada from whom we expect to receive valuable information on the subject matter of this committee.

A TRIBUTE TO CARLOS J. FINLAY FOR HIS DISTINGUISHED SERVICES TO SCIENCE AND HUMANITY IN THE DISCOVERY OF THE MODE OF PROPAGATION OF YELLOW FEVER.

By BENJAMIN LEE, M. D., Philadelphia.

The American Medical Association at its last annual meeting honored itself in honoring the memory of Walter Reed, Surgeon of the United States Army, by providing for the establishment of a permanent memorial which shall recognize and perpetuate to future generations the admirable work accomplished by him in demonstrating beyond the peradventure of a doubt the truth of the theory of the propagation of yellow fever through the bite of a species of mosquito, and developing in all its ultimate details the method of eradicating this terrible scourge of one of the fairest regions on the globe, a scourge which has cost more in lives and in money than any disease since the plague and the black death of medieval times, and which for centuries kept a large portion of the people of the greater republic represented in this Association in a state of constant terror. Those who were so fortunate as to participate in this demonstration of respect will never forget the scene. In the short space of half an hour nearly $10,000 was subscribed for this sacred object. Cheers and *viva's* filled the vast hall as the contributions were announced by one of America's leading surgeons. Flags and 'kerchiefs were waved, there was clapping of thousands of hands, hats and programs were thrown in air, and men and women vied in every expression of enthusiastic applause. No such scene was ever before witnessed in that staid and decorous body. None could have doubted that the medical profession at least recognized the fact, too often forgotten, that peace hath its heroes as well as war.

And yet, was there not a minor strain in this chorus of jubilation? Were not the tears which sprang unbidden to so many eyes those of sorrow not less than those of enthusiasm? For the ear which would so gladly have drunk in this meed of praise no longer responded to the vibrations of an atmosphere tremulous with the notes of fraternal acclaim. The generous heart, which would have throbbed tumultuously in recognition of this lavish tribute, had pulsed its last beat and was at rest forever. Still is it not fitting that, here on the soil of this beautiful island, consecrated by his labors, and which has been witness to the miracle made possible by the efforts of himself and his associates, one of whom, at least, sleeps in a martyr's grave, we of the American

Public Health Association, whose studies and pursuits enable us to understand even better than the members of the medical profession at large the greatness of this achievement, should re-echo the plaudits which, mingling with the roar of Atlantic's surges, may well have been carried to these neighboring friendly shores, and express in no uncertain terms our conviction that no investigation in the whole history of medical and sanitary science has ever been prosecuted with greater zeal, energy, fearlessness, intelligence, accuracy and triumphant result than that of the Yellow Fever Commission of the United States Army, of which the lamented Reed was the honored head?

A duty and a privilege, however, not less imperative and happily without tinge of regret for culpable tardiness still awaits us. Nearly twenty years before the occurrences which placed Cuba among the republics of the new world, and thus afforded this commission its opportunity for prosecuting its inquiries with all the authority and wealth of the United States at its back, and eight years before, a resolution was offered before this Association declaring that the sanitary interests of the United States demanded the annexation of Cuba, no hope for the introduction of hygienic improvements being in sight so long as Spanish misrule exercised its baleful domination over the enthralled island, a Cuban physician who had all his life been an observer of the behavior of yellow fever, both endemically and epidemically, and was familiar with it in its every phase, gave to the world the result of his long, patient, solitary investigation as to the cause of that disease and its mode of propagation. I need hardly say that I refer to our distinguished President, Dr. Carlos J. Finlay, who has been so properly honored with the position of Chief of the Sanitary Department of the Republic of Cuba in recognition of his valuable services, extending over so long a series of years.

The first public announcement by Dr. Finlay of his belief that no theory could account for the transmission of yellow fever which considered simply the patient and the susceptible person to whom the disease may be communicated, but that a third agent is indispensable as a carrier of the infecting material, appears to have been made at the International Sanitary Conference at Washington, held February 18, 1881, in seconding a resolution looking to the appointment of a commission having for its object the scientific investigation of yellow fever.

This theory was based upon a careful review of the accepted or proposed theories then in vogue, whether of the contagionists or the noncontagionists, and of the observed facts adduced on either side, which facts he considered to be incontrovertible, and to be entirely inexplicable except by admitting the intervention of a third independent agency. This general statement of the theory was soon followed by a paper presented in the month of August following, before the Royal Academy of Medical, Physical and Natural Sciences of Havana, entitled "The Mosquito Hypothetically Considered as the Agent of Transmission of Yellow Fever."

This article opens with the abandonment of all theories previously advanced by him, such as those which attributed the origin and propagation of the disease to atmospheric influences, to miasmatic or meteorological conditions, to filth, or to the neglect of general hygienic precautions. Having thus cleared the decks for action, and disclaiming any intention of considering the nature or form of the morbific cause of the affection, he proceeds to build up an argument to prove that in a certain variety of mosquito we possess an agen capable of satisfying all the requirements which should be possessed by the hypothetical carrier of the morbific cause. Enforcing tribute on a wide range of literature devoted to the natural history of that insect, as observed for hundreds of years and in all portions of the earth, he finally comes down to two species, which appear to be native to Cuba, and one of which, denominated *Culex mosquito,* he considers to be the more probable disseminator of this infection. As a piece of purely inductive reasoning and logical arrangement of facts in establishing a hypothesis, this portion of the article is not surpassed by any contribution to medical natural history in modern days.

At this period of his investigations, Dr. Finlay appears to have been considering the possibility of inoculation against the disease by the bite of an infected mosquito more than that of actually stamping out epidemics. Five inoculations were made. The results were one typical mild case of yellow fever, two of abortive yellow fever, and two of ephemeral fevers. Among the suggestions with which this most important paper closes is the significant one that, "Should it be finally proven that the mosquito inoculation not only reproduces the yellow fever, but that it constitutes the regular process through which the disease is propagated, the conditions of existence and of development for that dipterous insect would account for the anomalies hitherto observed in the propagation of yellow fever, and, while we might on the one hand have the means of preventing the disease from spreading, non-immunes might at the same time be protected through a mild inoculation."

Here we see most clearly and unmistakably foreshadowed twenty-three years ago the conditions to-day existing, and which for the last four years have existed, as the result of following out and apmlifying

Dr. Finlay's original plan of investigation by our own commission with ampler resources and unlimited authority at its command.

Rarely is it given to an investigator to see his predictions so completely fulfilled.

Like all original investigators and propounders of new theories in medicine, however, Dr. Finlay could not escape the voice of calumny. As in the days of old, we kill our prophets and stone those who are sent unto us with messages of divine truth. He and his firm friend and collaborator, Dr. Claudio Delgado, who alone stood by him in this crisis, were branded by the physicians and scientists of Havana as veritable monomaniacs. In the face of the smiles of derision with which his theory was greeted on every side and the cutting epigrams which were directed against him personally, Dr. Finlay went on quietly and patiently working out his great thought, strengthening it by laborious research and careful experiment, and returning the malicious attacks of his enemies by courteously laying before them from time to time the constantly accumulating results of his investigations. Although derided by his own compatriots, in America and Europe his contributions were received with respectful attention and eagerly awaited. The difficulties in his path were, however, almost insurmountable, and it is quite possible to doubt whether, but for the providential interposition of the United States in the affairs of Cuba, his theory would not even now be awaiting its triumphal vindication and Havana would not still be a periodical menace to the health of that country and a terror to our people. The history of its gradual development has all the interest of a romance.

During the twenty years following its announcement and preceding its final absolute demonstration in detail by the United States commission, Dr. Finlay's contributions to learned societies and medical journals, each at some length and evincing careful preparation, had numbered thirteen, and since that period, ten, while minor publications and those published in collaboration with Dr. Delgado carry the number up to thirty-eight.

During the same period, by permission of the intelligent general-in-chief, Blanco, inoculations with recently contaminated mosquitoes had been performed either by Dr. Finlay or his collaborator, Dr. Delgado, upon one hundred and three immunes.

As a result of this combination of theoretical study and practical investigation, the former had so far advanced from his original position as to be able, in 1898, to formulate the following conclusions:

1. That the germ of yellow fever is only pathogenic for human beings where introduced by inoculation.

2. That this inoculation is performed in nature by the bite of the *Culex mosquito* (*Stegomyia fasciata.* Theo.), the insect having been previously infected by biting a yellow fever patient within the first five days of the illness of the latter.

3. That as to the question of inoculation the bites of a recently infected mosquito will produce only a mild attack of yellow fever, while those of one which has been infected for a longer period may produce severe or even fatal attacks.

4. That once contaminated, this mosquito retains the power of inoculating the disease for the remainder of its life.

5. That, following the lines of this investigation and its conclusions, it ought to be possible to stamp out yellow fever in Cuba and Porto Rico.

The essentials for accomplishing this result were then outlined with much precision, and it was by practically conforming to these suggestions that Major Gorgas was subsequently enabled to bring this great work to a successful result.

The names of Reed and the heroic Carroll, of Agramonte, and Lazear, the martyr; of Gorgas, Ross and Guiteras, must all be blazoned high on the scroll which shall memorize this triumphant episode in the history of State medicine, but does not the place of most conspicuous honor justly belong to him to whom this inspiration was first vouchsafed, and who so patiently and courageously maintained his thesis through long years of discouragement in the face of obloquy, derision and scorn? Shall not the elder and the younger republic join hands in mutual felicitations over this wonderful and beneficent achievement fraught with happiness and prosperity for both, and unite in assigning to each participant the honor which is justly his due?

BIBLIOGRAPHIC INDEX.

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REPORT OF THE COMMITTEE ON THE PURIFICATION AND PRESERVATION OF PUBLIC WATER SUPPLIES.

The features connected with this subject which have received most general discussion during the past year are the use of copper sulphate as an algicide and germicide and of copperas and lime as a coagulant.

COPPER SULPHATE AS AN ALGICIDE AND GERMICIDE.

Copper sulphate has long been known as a poison, and for at least 10 or 20 years it has been used for killing various lower forms of animal and vegetable life. In 1893 it was carefully studied at Hamburg by Krohnke, the results of whose studies were published in the *Journal for Gasbeleuchtung und Wasserversorgung,* Vol. 26, p. 513. Recently it has received renewed attention through the report published last spring by Dr. Moore and Mr. Kellerman of the U. S. Department of Agriculture, recommending its use for the destruction or prevention of algae growths in reservoirs, and for destroying certain pathogenic bacteria in water supplies.

In a majority of laboratories connected with state or municipal health boards or water boards in the United States this subject has apparently been studied to a greater or less degree during the past six months. Recent literature, however, is confined almost exclusively to the description of actual accomplishments in destroying algae growths in various small ponds and reservoirs. Some preliminary notes of scientific studies have been published, but for the most part those who are giving the subject most attention feel disposed to await further and more comprehensive data before expressing their views definitely on this many-sided proposition.

The committee under these circumstances considers it wise at this time to urge caution upon the members of the Association who have to deal with this matter. In the meantime, there are pointed out a few of the more interesting phases of this question, as follows:

Toxicity for Man.— While it is known that copper sulphate is a poison when taken into the human system in large quantities, and that it is apparently harmless when taken in minute quantities, the evidence is not now decisive as to the dividing line below which this chemical may be taken at frequent intervals without injury, and above which serious poisoning may result. In general terms, it appears from the report of Messrs. Moore and Kellerman that copper sulphate may be injurious when taken in daily quantities of about one-fourth to one-third of a grain, although some authorities place the amount at about one-half of the above (10 milligrams).

Chemical Reactions with Water.— As is the case with many chemicals when applied in small quantities to water, various reactions occur, depending upon the composition of the water to which it is applied. In the case of very soft waters containing vegetable matter, either in the form of living organisms or of dead material, in suspension or in solution, a considerable quantity of copper sulphate is likely to be absorbed by the organic matter. The amount of absorption, of course, depends much upon the quantity and quality of organic matter present. This absorbing action appears to be largely of a physical nature, and is comparable to the action of a mordant in dyeing processes. Copper sulphate, as such, is attached to the organic matter.

With waters containing more or less carbonate of lime and magnesia, that is, hard waters, and but comparatively little organic matter, copper sulphate is said to be converted into a basic carbonate of copper. Ordinarily this compound is insoluble, but its solubility under various conditions is not fully understood as present.

In very hard waters, in which considerable carbonic acid is present, either as free or as half-bound acid, still additional uncertainties are presented in connection with the formation and solvency of the basic carbonate of copper. The basic carbonate of copper while generally considered to be sparingly soluble in water, is quite soluble in water which contains free carbonic acid.

Without touching upon the question of oxidizing and reducing actions, it is seen that after application to various waters the copper sulphate is left in varying conditions, the effect of which is bound to produce different results in its influence upon various forms of life.

Effects as an Algicide. — Copper sulphate in quantities raging from one part in 2 millions to one part in 8 millions, (about 0.03 to 0.007 grain per gallon) has been found to destroy *Anabaena, Uroglena* and a number of other forms of algae and protozoa which, generally speaking, have thin cell walls as compared with some other forms. The thicker-walled vegetable forms require higher concentrations than those stated, and in the case of some of the animals producing tastes and odors in waters, concentrations apparently have to be as great as one in 10,000 (about 5.8 grains per gallon)—a prohibitive amount for public supplies. After organisms of a certain species have been eliminated from a body of water by means of copper sulphate, experiences in some places suggest that other and more hardy forms are given a better chance for development and, in order to remove these subsequent growths of organisms, higher concentrations may be required. Furthermore, larger doses may be required by reason of the organisms becoming habituated to the treatment. How general this experience may be is now unknown.

Effect as a Germicide.— Evidence is somewhat conflicting regarding the destruction of disease germs by copper sulphate, although in general it would seem that concentrations from 1 in 25,000 to 1 in 100,000 (about 0.5 to 2.0 grains per gallon) will destroy such non-sporing bacteria quite completely in 12 to 15 hours. The effect of copper on flagellated bacteria is said to be especially marked. The discordant results which have been reported more or less informally from several places are no doubt associated with the different reactions which result when copper sulphate is added to different waters in accordance with the general statements above made. One feature worth mentioning in this connection is that careful control experiments must be made in all this work, as it is found that mere dilution alone causes an apparent diminution after several hours in the bacterial contents of waters where no copper sulphate at all is added.

Stimulation of Vegetable Growths.— The addition of copper sulphate to kill some forms of life appears from some observations to stimulate to an unusual degree the growth of other forms of life. How far these observations refer to unusual or exceptional happenings cannot now be told, but the point is one worth bearing in mind.

Effect of Temperature.— The lower the temperature the slower does copper sulphate act as a germicide, and this should be borne in mind in connection with studies upon the destruction by this means of typhoid fever germs or other pathogenic bacteria. As an algicide this factor is not ordinarily of much significance, but it would likely be so if this compound were used for the destruction of animal life such as sometimes during the cold season of the year produces objectionable tastes and odors.

Time Required.— This factor, like that of temperature, refers to the use of copper sulphate as a germicide rather than as an algicide, and bears upon the views advanced by some with reference to applying copper sulphate as the water enters a system of distributing pipes. Generally speaking, disease germs are not killed completely by any means in the first 5 to 10 hours after treatment with moderate quantities, but they require periods from 15 to 20 hours for moderate doses to be effective.

Effect on Fish.— Different fish are affected differently by copper sulphate. Some observers have found that concentrations of 1 in 2 to 5 millions (0.03 grains per gallon) kill fish to a degree which is objectionable. Here again the character of the water may be an important factor. More evidence on this point, however, is necessary.

Disposition of Copper.— From what has been said above with reference to the reaction of copper sulphate with various waters, it is plain that under different conditions the copper will be disposed of in different ways. After 24 hours more or less of the copper may subside to the bottom of the reservoir, either in the form of an insoluble precipitate (probably basic carbonate) or attached by absorption to suspended organic matter, either dead or living. In most cases the copper will not be found in the main body of water just after subsidence. However, the sedimentation of the copper does not mean its ultimate disposal, for the reason that winds, changing temperatures, etc., make it quite possible that some of the deposit containing copper may find its way back into the main body of water. Disturbances of the sediment, generally speaking, do not mean the re-dispersing of the copper throughout the full body of water but make it quite possible for some portions of the water to contain much more than their proportional share of the copper as originally applied.

Uniform Application.— If one-third of a grain of copper prejudicially affects the human system, it is quite plain that it will not do to apply copper sulphate in a haphazard manner to bodies of water used for drinking purposes. In fact, it ought not to be applied at all if it cannot be done under intelligent and careful supervision of properly trained representatives of a health board or water board. Caretakers of reservoirs should be prohibited from applying this chemical except under direct supervision.

Relation to Water Filtration.— No one who has studied this matter carefully claims that copper sulphate is a substitute for filtration, as seems to be the opinion among the laity in some places. In fact, in connection with public water supplies the benefit of copper sulphate seems to be confined very largely to the destruction of objectionable algae growths in water which is afterwards filtered. There is good reason for believing that ordinarily a complete elimination of copper from the water will result from careful filtration after treatment. Waters containing ingredients dissolving the basic carbonate should be carefully studied before being included in this class.

Where waters after filtration are stored in open reservoirs and algae growths result, it is the sense of the committee that copper sulphate ought to be used only with great caution, if at all, as there are usually no effective means of preventing the copper at intervals from passing in objectionable quantities to the consumers. Under these circumstances, which apply also to the storage of ground waters, corrective measures properly relate to comprehensive changes in the facilities for storing water,— usually reservoir covers or arrangements of inlet and outlet pipes to prevent stagnation.

Copper sulphate for improving the hygienic quality of water supplies has been proposed in a number of instances as a temporary expedient pending the construction or completion of filtration works. Based on present evidence, the committee does not look with favor upon this procedure, as at best the destruction of disease germs by applying copper sulphate is, from a strictly hygienic standpoint, no more than a substitute for boiling the water. It is believed by the committee that boiling is much the safer procedure to be recommended under such circumstances.

Relation to Sewage Purification.— In sections of the country where sand is not available for the filtration of sewage, the indications at the present time point to the practicability of using coarse-grained filters, such as contact beds or sprinkling filters. With these devices it is feasible at quite moderate expense to obtain a non-putrescible effluent. Hygienically, however, these non-putrescible effluents are not purified to anything like the degree noted with intermittent sand filters. The treatment of sewage effluents with copper sulphate followed by sedimentation in suitable basins suggests a possible procedure under some circumstances. Incidentally, this is being studied at the sewage testing station at Columbus, Ohio, as outlined in the preliminary notes presented by Messrs. Johnson and Copeland at the Laboratory Section meeting of yesterday. Generally speaking, such treatment requires a concentration of about 1 in 50,000, or, roughly, one grain to the gallon, which, with copper sulphate at six cents per pound, represents a cost per million gallons of about $8.50.

TREATMENT OF THE ST. LOUIS WATER SUPPLY BY COAGULATION WITH COPPERAS (FERROUS SULPHATE) AND LIME, FOLLOWED BY SEDIMENTATION.

During the past year the muddy water, which for years has been so characteristic of the supply of the city of St. Louis as delivered to its consumers, has given place to a fairly clear water, although the source of supply has remained the same. The new features in the treatment of the muddy Mississippi River water at St. Louis have attracted wide attention on account of the large number of visitors to the St. Louis Exposition, and the number of scientific and professional societies which have convened there.

In view of the discussion which this subject has received before various organizations, and particularly in view of the fact that it is set forth in considerable detail before this meeting in the paper of Dr. Snodgras, it is fitting that the topic be reviewed briefly by this committee.

Process Outlined.— In brief, the modification in the treatment of the St. Louis water supply during the past year consists in the discontinuance of plain sedimentation in the shallow open basins having a gross capacity of between two and three days' supply, and in the substitution therefor of a coagulating process by copperas and lime before the water enters the settling basins through which the coagulated water now passes as before. The process at present is still further facilitated by the use of weirs, which allow the clearer water at the surface to pass from one basin to another and thence to the conduit leading to the city.

Process Not New.— This process is by no means new. In fact, coagulation and sedimentation of water for purposes of clarification and purification have been practiced for several thousands of years, although of course on a scale far smaller than that at St. Louis. Coagulation with the aid of alum, followed by settling, was frequently practiced in the early ages by the Chinese and Egyptians, and it has also been quite customary throughout the South on numerous plantations which are dependent on muddy water as sources of supply. Here barrels of water are treated with alum, a crystal of which is placed in the split end of a stick and stirred about in the water in the barrel for a short time. After the water so treated has been settled for some hours it is found to be quite clear and satisfactory as a source of domestic supply.

Coagulation and sedimentation along the general lines practiced at St. Louis have been a preliminary feature for many years in the treatment of numerous supplies of Holland, although this treatment is followed by filtration. It has also been practiced (without filtration) at a number of plants at intervals in the Missouri Valley, notably at Kansas City and at Omaha. It was also practiced a number of years ago at Chester, Pa.

The St. Louis process is almost exactly parallel with the chemical precipitation process in sewage works, which during the past generation has been practiced in more than 200 different plants in Europe, and in a number of instances in this country. Copperas and lime have been generally used as precipitants as is the case at St. Louis, and the only difference is that the period and conditions of sedimentation are less complete in sewage works than at St. Louis.

Coagulants Used.— At numerous places careful studies have been made of the relative merits for coagulation of the copperas and lime treatment and of sulphate of alumina, commonly known as alum.

There are two advantages claimed for the copperas and lime, namely, economy and the production of large masses of coagulant, enabling clarification to be accomplished in smaller basins, other things being equal.

The disadvantages of copperas and lime vary with the character of the water to which it is applied. With the fairly soft, non-clay-bearing waters of the East, as in the case of the Passaic River at Little Falls, N. J., the process was found to be impracticable owing to the difficulty in getting a well coagulated water without danger at intervals of getting an objectionable excess of either lime or dissolved iron in the filtered water.

At Lorain, O., Quincy, Ill., and a number of other places in the Mississippi basin, this process is said to have met with a fair degree of success. In general it has been found that it works very much better with hard clay-bearing waters than is the case with eastern waters.

When a water is so muddy that it requires for its coagulation very large amounts of sulphate of alumina, present indications are that the copperas and lime treatment becomes economical, although its economy is not ordinarily apparent when applied in quantities much less than the limit above indicated.

With these markedly muddy waters it appears that ordinarily the process can be carried out successfully. At intervals, especially when the composition of the river water is rapidly changing, complications have been encountered at all or nearly all plants, and the treated water has not been fully satisfactory. The use of too much lime may make the treated water slightly caustic, and even if the proper amount of lime is used, and the treatment is not followed by some method of carbonation or its equivalent, troublesome deposits of calcite may occur in the distribution pipes. How far these difficulties are inherent to the process under various local conditions, and how far they may be overcome successfully is a matter that cannot be foretold from present evidence.

Efficiency of Process.— The figures presented at this meeting by Dr. Snodgras as to the efficiency of the process at St. Louis refer essentially to periods of most muddy water, and it is to be borne in mind that the percentages of removal of suspended matter and of bacteria, while high, are not so very much greater than was the case with plain sedimentation as formerly practiced, and with which the removals were ordinarily from 80% to 90% and more. This is of course due to the fact that so much of the suspended matter in the water coming from the Missouri River is coarse enough to be deposited very easily whether a coagulant is used or not.

The best means of judging of the efficiency of the process at St. Louis is to consider the residual composition of the water as it passes to the city. Here it is noted from the figures presented to this meeting that the suspended matter in the filtered water, given as 35 parts per million, is about five times as high as the quantity which is barely noticeable in an ordinary tumbler. When the river water is moderately clear, as at the present time, it is feasible to get a well clarified effluent. The people of St. Louis are no doubt gratified to get such comparatively clear water from the muddy Mississippi, although the water is not at all times as clear as called for under the requirements of modern water works practice. What is above said of suspended matter is generally true of the removal of bacteria.

Scope of Process.— The true scope of a coagulating process of the general nature such as practiced at St. Louis is to prepare adequately for filtration a water which is so colored or so muddy that it cannot be applied to the filters after plain sedimentation, as has been shown by extensive investigations conducted at Louisville, Cincinnati, New Orleans and other places. From this standpoint the process at St. Louis is a success. It is not, however, comparable to filtration in its efficiency at all times, as it is subjected to disturbances of the sediment on the bottom of the basin by wind action, varying velocities, temperature changes, and there are no opportunities for the correction of these and other objectionable conditions after the water leaves the basins and before it reaches the consumers, as is the case when this treatment is supplemented by filtration. These features have been developed as the result of numerous investigations at various places, and the process as a whole, while a distinct step in advance over plain sedimentation, is by no means a complete substitute for coagulation, sedimentation and filtration, as was ruled by the courts at Chester, Pa.

STATUS OF FILTRATION METHODS.

This is a period of practical accomplishments in the field of water filtration, and of the application of the fundamental principles developed during the past decade, as set forth in the report of this committee at the Indianapolis, Ind., meeting in 1900. So far as fundamental principles are concerned, there are no important features to add to or take from the statements there made. In technical details leading to more efficient management of plants, and to economy in operation, numerous improvements are under consideration, but they are of too technical a nature to find properly a place in this report.

FILTERS NOW IN USE.

At the International Engineering Congress at St. Louis last autumn there was presented a paper by a member of this committee, Mr. Hazen, in which there are some statistics of interest as to the development of filtration in the United States. At the present time there is about 10% of the total population in towns and municipalities of more than 2500 population in which consumers are supplied with filtered water. Thus it is estimated that there was a total urban population in the United States in 1904 of 32,700,000 people, of which 560,000 were supplied with water from sand filters, and 2,600,000 with water from mechanical filters, making a total of 3,160,000, or 9.7%. This statement shows that there has been an increase of 70% during the past four years in population supplied with filtered water.

There is every reason to believe that in the next few years the rate of progress in the introduction of filtered water will be still more marked, as, in addition to the various important plants now under construction, at Louisville, Philadelphia, Washington, Providence, Indianapolis, New Haven, Hackensack, etc., the indications are that during the coming season contracts will be let for filters at Pittsburgh, Columbus, Cincinnati, Toledo and New Orleans.

In the instance of cities in the United States of more than 25,000 population it is estimated in the paper referred to that in 1904 7.9% were supplied with filtered water; 11.4% had filters under construction; 21.4% had filters either authorized or recommended officially; 31.1% had water of a sanitary character requiring either filtration or a new supply; 22.2% had water of reasonably satisfactory quality, and probably not needing filtration for a long time; and 6% had water of good quality, not requiring filtration.

HYGIENIC EFFICIENCY OF FILTRATION.

The vital statistics from cities in this country in which filtered water is used are becoming more and more adequate for enabling well defined comparisons of them to be made with corresponding improvements in the health of communities which have changed their water supply from a polluted source to a ground water supply or to one from uncontaminated sources. The paper of Mr. Hazen presented at the St. Louis congress enters into this matter quite fully. It shows that cities having a well filtered supply from polluted sources as a general proposition not only have typhoid fever death rates as low as cities recently provided with a ground water supply or surface waters from uncontaminated upland sources but that they also have corresponding reductions in the total death rate. In percentages the improvement due to good water is not so marked in the case of the general death rate as in typhoid fever rates although in the actual number of lives saved the data dealing with the total deaths are most important.

These statements are of course made in general terms on the basis of numerous averages, and for that reason point unmistakably to general truths. It is a well recognized fact, as pointed out in detail in the paper mentioned, that there are other factors besides water supply influencing death rates of water-borne diseases which have to be taken into consideration, and which differ in various cities. These factors, showing general progress in the improvement of other sanitary conditions, are of significance in explaining in many cities a portion of the reduction in death rates where improved water supplies have been introduced recently; but, in comparison, pure water is of predominating importance, and substituting a pure supply for an impure one has even reduced the death rate to an extent hardly reached by other sanitary improvement.

(Signed) GEORGE W. FULLER, *Chairman.*
H. W. CLARK.
ALLEN HAZEN.
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A PRACTICAL TEST OF THE COPPER SULPHATE METHOD FOR THE REMOVAL OF MICRO-ORGANISMS FROM WATER.

By F. S. HOLLIS, Ph. D., New Haven, Conn.

In Bulletin No. 64, Bureau of Plant Industry, U. S. Department of Agriculture, Dr. George T. Moore and Mr. Karl F. Kellerman published in May, 1904, a method for destroying or preventing the growth of algae and certain pathogenic bacteria in water supplies by the use of copper sulphate. The method was based on a thorough review of the subject of the toxicology of copper, extended laboratory experiments under different conditions upon the action of copper sulphate on various micro-organisms, certain bacteria and such higher forms as fish that might be influenced by its presence. In addition they gave the results of several practical applications in reservoirs of moderate size and a considerable experience in its application to the water of cress beds.

During the past summer numerous practical applications of the method have been made either by Dr. Moore and Mr. Kellerman or with their advice, as well as by independent workers, the results of most of which are as yet unavailable.

The method is one which has caused general interest as, heretofore, all that could be hoped for, even with a regular and systematic microscopical examination of the water, was to be able to avoid as far as possible growths of micro-organisms by drawing the water from such part of the reservoir or from such depth as was found to be least infected with growths. This was possible, as a rule, only in the larger reservoirs so constructed that water could be drawn from different depths and in cases where the growth had a somewhat localized vertical distribution. Little help was offered in the more numerous shallow reservoirs in which growths are most likely to develop in greatest abundance, unless the system consisted of several reservoirs and the infected reservoir could be temporarily cut out of the supply.

The following account is of a practical test of the method on the two storage reservoirs of the Greenwich, Conn., Water Company, made with the advice of Dr. Moore and Mr. Kellerman, and is offered in the hope of enlisting interest in the trial of a method which seems to promise much and as a record of one of the many results that must be collected before comparisons can be made which will lead to a complete understanding of the possibilities and limitations of the method and the best method of applying it.

The reservoirs are situated at about the center of the township of Greenwich, four and five miles north of the most populous part and are used also as a source of supply for Port Chester and part of Rye. They are fed with surface water and to some extent from springs, have but small and short influent streams and are situated in adjoining drainage areas. Most of the land for some distance back from the shore is owned or controlled by the water company.

ROCKWOOD RESERVOIR.

The upper or Rockwood reservoir has an area of 93 acres with about 7 of shallow flowage, an average depth of 20 feet and a capacity, when filled to the overflow at an elevation of 323 feet, of 325,000,000 gallons. The drainage area contains about one square mile and is hilly and partly under cultivation. About the upper tenth is cut off from the main body by a causeway without other connection than through the loose stone work and filling. The reservoir was formed in 1893 by building two dams or dykes and without removing surface soil from the meadow land and pasture which was flooded. Trees that were within the area of the reservoir were cut near the ground and the stumps mainly left, some of which are exposed at low water.

PUTNAM RESERVOIR.

The lower or Putnam reservoir has an area of about 100 acres with four or more of shallow flowage, an average depth of 15 to 20 feet and a capacity when filled to the overflow at an elevation of 290.5 feet of 300,000,000 gallons. The drainage area contains about two and a half square miles and a small influent stream brings considerable water at certain seasons from the upper part of this area, which is hilly, about one-third wooded and the remainder partly under cultivation.

This is the older of the two reservoirs, upon which work was commenced in 1879 and an additional storage capacity obtained by raising the elevation of the dam in 1887. No surface loam was removed.

The water of each reservoir has given more or less trouble in the past by supporting considerable growths of floating micro-organisms, and every spring there has been, especially in Rockwood reservoir, a large development of the larger forms of *Spirogyra* and *Conferva*.

The microscopical examination of monthly samples from Rockwood reservoir for 1896 showed a considerable growth of *Synedra* between January and May with a maximum growth in April, of *Peridinium* between January and May and the presence of a growth of *Dinobryon* throughout the year except during May and June, with very large numbers during August and September.

The microscopical examination of samples from Putnam reservoir for 1898 showed the presence of a considerable growth of *Synedra* from January to August, of *Anabæna* from July to November, with the greatest development during August, of *Uroglena* from August to November, reaching highest numbers in September and October and of *Dinobryon* between February and July, with particularly high numbers during May and June.

Water from each reservoir flows by gravity through separate pipes to a filter-house some distance below Putnam reservoir, where all the water is treated by mechanical filtration before it enters the distributing mains.

The filtration plant consists of four vertical tanks, each ten feet in diameter, and two horizontal tanks each ten feet in diameter and twenty feet long, giving a combined capacity of two million gallons or more per day.

At the time of undertaking the experiments about 3,000,000 gallons per day were being drawn from the two reservoirs, about half of which was filtered after treatment with 1.4 grains of alum per gallon, and the remainder was used in washing the filters, which was done thoroughly once every 24 hours. Later the amount of alum was reduced somewhat, and an attempt made to reduce the amount of water used in washing the filters.

The alkalinity of the water varied between 13.8 and 15.6 parts of calcium carbonate per 1,000,000, and was more than was necessary to react with the copper sulphate and the alum in the subsequent mechanical filtration. Copper suphate was added according to the method suggested by Dr. Moore, by suspending it from the boat in burlap bags, each containing 25 pounds, to which a fresh charge was added when the first lot was dissolved to from 5 to 8 pounds.

From one to three bags were used at a time according to the nature or extent of the growth present in the part of the resevoir under treatment, as determined by inspection or previous microscopical examination. Most attention was given to making the addition along the shore and in the bays and shallow flowage areas, which seemed to be the important breeding places of growths. Generally a run of several hundred feet was made along the shore to some fixed point, then across and down the opposite shore to a fixed point and again across to the point left on the shore first treated, thus making from twelve to twenty trips across and frequently additional trips across at the lower or wider part of the reservoir if growths were abundant.

The time required for making the application was two and a half hours for 250 pounds for the three additions of this amount and three hours for 350 pounds, or about fifty-five minutes for each hundred pounds.

The copper sulphate is generally spoken of as being precipitated after being dissolved in the water, but it is a question how far this is the case, except as it unites with the organisms and is precipitated with them after their death. A mixture of copper sulphate with water having the character of that of these reservoirs containing as much as 1 part per 1,000,000 will give no precipitate on standing or will this amount give a precipitate of copper in any of the forms in which copper is ordinarily precipitated in testing for its presence, as shown by laboratory tests by Dr. H. E. Smith, or would any precipitate be expected at this dilution if the solubility of the different forms of copper is considered. This makes it necessary to evaporate a considerable amount of the water to a very small volume to be able to test for the presence of copper in the water after treatment.

It must be borne in mind, however, that as originally applied from the suspended bags, the copper sulphate has gone into solution in really a small volume and this concentrated solution is readily traceable as a colored streak as the boat progresses. This is usually clear, but in certain shallow parts of the reservoir appeared somewhat turbid, which may have meant precipitation or merely the presence of a greater quantity of organisms which acted to reflect the light against the blue colored solution as a back ground.

Calculated from the distance along the shore and the number of times that the reservoir was crossed, and using the average cross section of the number of bags used, it appears that the sulphate actually gave a solution in the line of the boat of about one part to 250 of water when adding the amount calculated to make one part in 5,000,000.

From this line of strong solution mingling takes place vertically by settling and laterally by the action of the wind and the forward motion of the water as the result of drawing from the reservoir at the dam. But one reservoir was treated at a time, and following each treatment the reservoir was not drawn upon for two days.

Copper sulphate was added to the extent of one part to 250 as calculated above to 1.5 liters of unfiltered and filtered water collected on December 19th, from Rockwood reservoir when it contained organisms amounting to 4389 standard units per c.c, mainly of *Dinobryon* and *Uroglena*.

In each case a considerable flocculent precipitate, colored by the copper, was formed, which settled slowly carrying down all organisms in the unfiltered sample and leaving the water above perfectly clear. Enough was not obtainable to furnish material for a detailed study as to the nature of the combination formed between the copper and the organisms.

TREATMENT OF ROCKWOOD RESERVOIR.

On first visiting the reservoir on July 11th, it was found to have been drawn down about three feet, thus reducing its contents to 235,000,000 gallons. The spring growth of *Spirogyra* and *Conferva,* which was particularly abundant at the lower end of the reservoir had become discolored and had either risen or was rapidly rising to the surface and being distributed by the action of the wind. This was found to contain little more than the sheath of the *Spirogyra* and *Conferva,* but mixed with it were other forms especially cyanophyceæ among which were large amounts of *Anabaena* flos aqua in a developing stage, which seemed likely to become the next growth of importance. Practically all of these patches of algae growths that had risen to the surface were collected by skimming from the surface or by scraping it from the bottom of the shallow portions which had been exposed as the result of drawing down the water.

At this time there were only moderate growths of floating forms and these were rather more abundant at the upper end of the reservoir and near the dam. Infusoria constituted a considerable part of the growth and *Chlamydomonas,* which developed so as to be the main cause of trouble throughout the remainder of the summer, was present in the portion of the reservoir above the causeway to the extent of 95 standard units per cc. Cyanophyceæ, while present in the patches of dead algae rising to the surface were not found free in the water. Another set of samples taken on July 26th the day of making the first application of one part of copper sulphate to 5,000,000, but before adding it, showed that during the interval an increase had taken place throughout the reservoir, the average of total organisms from four points in the reservoir being 452. *Anabaena* was not present, although other forms of the cyanophyceæ had developed to a slight extent. *Chlamydomonas* was present throughout the reservoir, but not in large numbers, the average being 31. Rotifera were present in considerable numbers, the average being 122. Bacteria were present to the extent of from 58 to 204 per cc. in different parts of the reservoir, being most abundant at the upper end and at the dam, the average for the four points of collection being 137.

On July 30th, four days after adding the copper sulphate to the extent of one part to 5,000,000 the average of the total organisms had dropped to 119, showing a decrease of about 74 per cent; Cyanophyceæ were absent save for the finding of a single piece of *Microcystis*. Diatomaceæ were reduced about 70 per cent, infusoria 85 per cent and the *Chlamydomonas* while present showed a temporary reduction of 80 per cent. Chlorophyceæ showed a reduction of only about 10 per cent and from 20 to 30 standard units of *Sphaerozosma* and *Protococcus* were present.

The bacteria were increased from an average of 117 to 2737 or about 23.5 times the number before treatment. The numbers from the four points of collection varied from 1800 to 4000.

On August 9th, two weeks after treatment, a single sample was taken near the dam which showed that the bacteria had decreased to 420 as compared with 3,000 four days after treatment and 189 before treatment. Total organisms had increased to 194 from 91 and the infusoria to 63 from 16, of which 53 were *Chlamydomonas*. As the difficulty from organisms and especially from *Chlamydomonas* continued, another application of one part to 5,000,000 of copper sulphate was made on August 23d, making the total amount added one part to 2,500,000. Before making this application another set of samples was taken from the usual four stations, which showed that the average of the total organisms had increased to 599. Diatomaceæ had increased to 198, chlorophyceæ to 107. Cyanophyceæ, represented by *Microcystis* alone showed an average of 28 and infusoria 115, of which 101 were *Chlamydomonas*, which were less abundant at the dam than elsewhere.

On August 26th, three days after the application, the average of total organisms from two of the stations was 200, a reduction of 67 per cent, of infusoria 59, of which 45 were *Chlamydomonas*, a reduction of 49 per cent. Diatomaceæ were reduced 80 per cent, chlorophyceæ 50 per cent and cyanophyceæ were absent. A sample taken at the dam on August 29th, three days later, showed little change.

The only form present after the first treatment that caused trouble was the *Chlamydomonas* and, as the authors of the method had found by experiment that this form was very resistant to the action of copper sulphate, one part to 5,000 killing but few after the prolonged treatment of a week and as the account of the treatment of the Elmira, N. Y., reservoir with one and one-third parts per 1,000,000 seemed to show that this amount killed certain forms of fish and pollywogs, it was deemed better not to add more copper sulphate which we felt would not serve to kill the *Chlamydomonas* unless added in quantities greater than it was thought best to add. *Chlamydomonas* continued to give considerable trouble during the early autumn imparting its peculiarly sharp and unpleasant odor to the water to such an extent that it was not entirely removed by filtration, but a sample taken early in November showed that it had finally disappeared.

A sample taken on December 19th, when the water of the reservoir was very low and covered with ice, showed total organisms 4389, of which 4165 were infusoria, 2812 being *Dinobyron* and 1287 *Uroglena*. As *Uroglena* is believed to be killed promptly by the presence of one part of copper sulphate to 2,500,000 and experiments have shown that it is practically all killed after sixteen hours by the presence of one part to 5,000,000 or even one part to 10,000,000, the presence of this growth speaks against much of the copper from the summer treatment remaining in the reservoir in an active form.

I have advised adding copper sulphate dissolved from bags through holes in the ice along the long narrow line of the reservoir, trusting to the forward movement of the water due to drawing from the lower end to effect mixing with the water.

TREATMENT OF PUTNAM RESERVOIR.

On first visiting the reservoir on July 11th, the total organisms were found to vary between 398 and 866, the average of four samples from different points being 691. More than half of these were diatomaceæ, mainly *Tabellaria*. Cyanophyceæ were present throughout the reservoir, the average being 62, with *Protococcus* the most abundant form. Cyanophaceæ were absent save for a little *Coelosphaerium* at the upper end of the reservoir. Infusoria were present in numbers varying from 103 to 297, the average being 167, about half of which were *Peridinium*.

Copper sulphate was added to the extent of one part to 5,000,000 on July 30th. Before making the addition, samples were taken from the upper part of the reservoir and near the dam, which showed that the average of total organisms had increased to 1510. The diatomaceæ had increased to an average of 1202, most of which were *Tabellaria,* chlorophyceæ had decreased to 32 and infusoria to 19, the growth of *Peridinium* having largely disappeared. Cyanophyceæ had increased to an average of 256, the growth being mainly one of *Anabaena gigantica* which was present throughout the reservoir and amounted to 250 near the dam.

The water weeds which were abundant especially in the shallow bays on the west side of the reservoir were thickly covered with gelatinous masses having a slight green color under the hand lens and shown by the microscope to be composed of nostoc or masses of bluish green filaments, representing a developing stage. The bacteria were low the average being but 87 per c. c. On August 9th, ten days after the treatment the total organisms had decreased to an average of 656 or a reduction of 56% while the water near the dam showed a reduction of 78%. The diatomaceaæ had decreased to an average of 206 or a reduction of 83%. Chlorophyceæ had increased from 32 to 232, *Protococcus* and *Dictiosphaerium* being most abundant. Infusoria had increased from an average of 19 to 199, *Trachelomonas* being most abundant and amounting to 283 at the upper part of the reservoir. Cyanophyceae had decreased to an average of 10 or about 96% and the growth of *Anabaena* had entirely disappeared and the large growth of nostoc on the water .weeds was nearly gone. Bacteria had increased from an average of 87 to 49 per cc., and it is possible that during the interval they may have been even higher.

A set taken August 23rd showed an increase of total organisms to an average of 1159, due mainly to an increase in the growth of *Tabellaria*. Cyanophyceæ were entirely absent in the lower part of the reservoir and were represented by only a small amount of *Microcystis* in the upper part. Infusoria had decreased, due to the disappearance of the growth of *Trachelomonas*, but *Chlamydomonas* had appeared to the extent of about 25 in all parts of the reservoir.

A second application of copper sulphate of one part to 5,000,000, making in all one part to 2,500,000, was made on August 26th. Before making the application, a set of samples was taken which showed an average of total organisms of 2159 or about double the number present but three days before, due to a large increase in the growth of *Tabellaria*. The chlorophyceæ showed an average of 230, infusoria an average of 37, of which 27 were *Chlamydomonas* and cyanophyceæ were absent. Bacteria had decreased to an average of 141 per cc.

On August 29th, three days after the treatment, a sample taken at the dam showed total organisms 1117 or a reduction of about 45 per cent, chlorophyceae showed 211 or a reduction of only 8 per cent, cyanophyceae continued absent and the infusoria showed 37 or the same number as before the second treatment, 20 of which were *Chlamydomonas*.

While the *Chlamydomonas* was not removed by the two applications of copper sulphate, the growth did not assume the proportions of the one in Rockwood reservoir and the water of this reservoir remained such that, with the filtration, there has been little if any cause for complaint. A sample taken on December 19th showed but a moderate growth, the total amounting to 246, with infusoria 66, of which 44 were *Cryptomonas* and no *Chlamydomonas*. The few chlorophyceæ amounted to 43.

The rather wide variations in the amount of amorphous matter in the samples is, I believe, to be accounted for wholly by the action of the wind which caused material from the bottom of the rather shallow reservoirs to be brought up and mingled throughout the water of the reservoir, even to the extent of causing the turbidity as determined by disc readings to vary widely on different days. In no case was the nature of the amorphous matter such as to indicate that it was composed mainly of the recently killed organisms as the result of the sulphate treatment.

It is useless to attempt to draw general conclusions from such comparatively limited data from experiments on only two reservoirs containing water of similar character, as it is by no means certain that similar growths in water of a different character would be acted upon in the same way by similar treatment.

Certain facts, however, are so marked as to lead to the belief that they represent general characteristics and may be expected under all conditions.

The most marked of these is the apparent great susceptibility of the cyanophyceae even to small quantities as shown by the prompt and complete disappearance of the considerable growth of *Anabaena* which was uniformly distributed throughout the entire water of Putnam reservoir by the single addition of copper sulphate to the extent of one part to 5,000,000 and the rapid disappearance of the nostic form from the water weeds by the same addition, a growth which I believe represented a developing stage and which would soon have been scattered throughout the reservoir.

As growths of cyanophyceæ are of frequent occurrence, often reaching large numbers and nearly always impairing the character of the water by imparting during the period of growth as well as of decay a characteristic odor and taste, commonly known as the "pig-pen" odor, the method would seem to afford an easy way of quickly removing objectionable growths of this kind or of preventing them in case regular microscopical examinations are made which forecast their appearance.

While an opportunity was not offered to try the method on large growths of chlorophyceæ, it has been a matter of surprise that such as were present were apparently but little influenced and in a few cases developed to some extent within a few days of the time of the treatment.

Both diatomacæ and infusoria appear in every case to have been reduced temporarily by the addition of such amounts as were used, thus holding them temporarily in check. The amount added was, however, insufficient to more than retard their growth, and after a short time they increased. The infusoria appeared to be less active immediately after a treatment, as seen in the microscopic examination.

It is even a question whether certain of the infusoria, as th *Chlamydomonas* were not assisted in their development by the addition of such a quantity of sulphate that, while it did not materially decrease their numbers, proved fatal to other forms, thus providing them with an abundant food supply.

The temporary increase in the number of bacteria may readily be accounted for in the same way. It was not expected that they would be killed by the amount of copper sulphate used, which, however, was sufficient to kill a great many of the micro organisms, thus converting these into available food for the bacteria. The results are given in a concise form on the two following tables.

ROCKWOOD RESERVOIR, GREENWICH, CONN., WATER COMPANY.

ORGANISMS AND AMORPHOUS MATTER EXPRESSED IN STANDARD UNITS PER C.C.

One standard unit is a square field 20μ on a side.

	1904.	Total Organisms.	Diatomaceae.		Chlorophyceae.		Cyanophyceae.		Infusoria.		Rhizopoda.	Rotifera.	Amorphous.	Alkalinity.	Bacteria per c. c.	Temp. of water.
			Total.		Total.		Total.		Total.							
Above causeway	July 11	379	45	Navicula 45	21	....	0	....	228	Chlamydomonas 95	10	75	405	15.2	......	25.5°C
Below causeway	“ 11	390	86	Melosira 50	.....	....	0	....	159	Chlamydomonas 95	0	132	427	15.0	......	25.5
Middle of reservoir......	“ 11	193	98	Melosira 62	6	....	0	....	89	....	0	0	417	14.0	......	25.5
At dam	“ 11	542	98	Melosira 58	28	Conferva 25	0	....	119	Peridinium 88	15	298	290	14.0	......	25.5
Average...........	....	378	105	....	14	....	0	....	143	....	7	125	......	......	......	......
Above causeway	July 26	458	53	Melosira 25	88	Sphaerozosma 68	25	Coelosphaeri’m 18	132	Chlamydomonas 19 Peridinium 62	0	148	427	14.6	204	23.6
Below calseway	“ 26	437	87	Melosira 63	39	Staurastrum 19	25	Microcystis 25	172	Chlamydomonas 20 Peridinium 88	0	118	506	13.6	58	23.6
Middle of reservoir......	“ 26	581	98	Melosira 88	118	Micrasterias 68	38	Microcystis 25	140	Chlamydomonas 8 Peridinium 75	0	140	418	13.8	99	23.6
At dam	“ 26	384	58	Melosira 88	22	Staurastrum 12	25	Microcystis 25	201	Chlamydomonas 98	0	80	438	14.0	189	23.7
Average...........	....	452	74	....	66	....	28	....	161	....	0	122	......	......	187	......

350 pounds copper sulphate added (=1 part to 5,000,000) on July 26th after taking above samples.

ROCKWOOD RESERVOIR, GREENWICH, CONN., WATER COMPANY—Concluded.

	1904.	Total Organisms.	Diatomaceae. Total.	Diatomaceae.	Chlorophyceae. Total.	Chlorophyceae.	Cyanophyceae. Total	Cyanophyceae.	Infusoria. Total.	Infusoria.	Rhizopoda.	Rotifera.	Amorphous.	Alkalinity.	Bacteria per c c.	Temp. of water.
Above causeway	July 30	189	50	Melosira 38	57	Gloeocystis 20	0	....	32	Chlamydomonas 5	0	0	438	14.0	1800	25.0
Below causeway	" 30	176	13	Navicula 13	84	Sphaerozosma 28	0	....	39	Chlamydomonas 9 Glenodinium 20	0	30	470	14.0	2150	25.0
Middle of reservoir......	" 30	72	15	Navicula 8	46	....	0	....	12	Chlamydomonas 4 Trachelomonas 8	0	0	348	14.0	4000	24.5
At dam	" 30	91	15	Navicula 10	50	Sphaerozosma 25	10	Microcystis 10	16	Chlamydomonas 6	0	0	277	14.0	3000	24.5
Average...........	....	119	22	....	59	....	3	....	25	....	0	8	......	......	2737	......
At dam	Aug. 9	194	30	Melosira 23	51	Protococcus 23	0	....	63	Chlamydomonas 53	0	50	415	14.0	420	24.5
Above causeway	" 23	509	115	Melosira 88	203	Dictiosphaeri'm 45 Sphaerozosma 40	38	Microcystis 38	57	Chlamydomonas 34	0	68	787	14.0	......	22.0
Below causeway	" 23	1025	248	Navicula 245	106	Dictiosphaerium 38	75	Microcystis 75	234	Chlamydomonas 226	0	358	2512	15.0	......	22.0
Middle of reservoir......	" 23	402	183	Navicula 168	91	Gloeocystis 25	0	....	112	Chlamydomonas 107	0	0	570	15.0	......	23.0
At dam	" 23	447	245	Navicula 220	29	....	0	....	55	Chlamydomonas 35	0	110	552	15.0	......	23.5
Average...........	....	599	198	....	107	....	28	....	115	....	0	184	......	......	......	......

250 pounds copper sulphate added (=1 part to 5,000,000) on Aug. 9th after taking above samples.

	1904.	Total Organisms.	Diatomaceae. Total.	Diatomaceae.	Chlorophyceae. Total.	Chlorophyceae.	Cyanophyceae. Total	Cyanophyceae.	Infusoria. Total.	Infusoria.	Rhizopoda.	Rotifera.	Amorphous.	Alkalinity.	Bacteria per c c.	Temp. of water.
Below causeway	Aug. 26	287	48	Navicula 23	35	Sphaerozosma 8	0	....	62	Chlamydomonas 35	0	80	140	......	257	23.0
At dam	" 26	168	27	Navicula 15	18	Gloeocystis 10	0	....	56	Chlamydomonas 56	0	60	2225	......	558	23.0
Average...........	....	200	37	....	26	....	0	....	59	....	0	70	......	......	408	......
At dam	Aug. 29	225	90	Navicula 88	40	....	0	....	45	Chlamydomonas 43	0	50	1750	......	......	......

PUTNAM RESERVOIR, GREENWICH, CONN., WATER COMPANY.

ORGANISMS AND AMORPHOUS MATTER EXPRESSED IN STANDARD UNITS PER C.C.

One standard unit is a square field 20µ on a side.

	1904.	Total Organisms.	Diatomaceae.		Chlorophyceae.		Cyanophyceae.		Infusoria.		Rhizopoda.	Rotifera.	Amorphous.	Alkalinity.	Bacteria per c. c.	Temp. of water.
			Total.		Total.		Total.		Total.							
Upper part, opp. point...	July 11	398	90	Melosira 50	39	Eudorina 20	70	Coelosphæri'm 50	108	Peridinium 88	0	60	225	14.0	......	25.5°C
Middle of reservoir......	" 11	660	480	Tabellaria 355	65	Pandorina 40	0	....	100	Peridinium 75	0	0	375	18.0	......	25.5
Opp. ice house point....	" 11	839	470	Tabellaria 370	100	Protococcus 50	0	....	169	Peridinium 75	0	100	760	15.2	......	25.5
At dam	" 11	866	457	Tabellaria 392	63	Protococcus 25	0	....	397	Peridinium 188	0	50	427	15.0	......	25.5
Average...........	....	691	374	....	62	....	17	....	167	....	0	53	......	......	......	......
Upper part, opp. point...	July 30	1005	755	Tabellaria 742	30	Protococcus 23	200	Anabæna 188	20	Trachelomonas 15	0	0	233	14.0	90	25.5
At dam	" 30	2015	1648	Tabellaria 1560	34	....	313	Anabæna 250	18	....	0	0	268	14.4	84	25.0
Average..........	....	1510	1202	....	32	....	256	....	19	....	0	0	......	......	87	......

250 pounds copper sulphate added (= 1 part to 5,000,000) on July 30th.

PUTNAM RESERVOIR, GREENWICH, CONN., WATER COMPANY—Concluded.

	1904.		Total Organisms.	Diatomaceae.		Chlorophyceae.		Cyanophyceae.		Infusoria.		Rhizopoda.	Rotifera.	Amorphous.	Alkalinity.	Bacteria per c c.	Temp. of water.
				Total.		Total		Total		Total							
Upper part, opp. point...	Aug.	9	861	239	Tabellaria 188	241	Dictiosphaerium 83	8	Oscillaria 8	354	Trachelomonas 283	0	30	562	14.8	650	24.5
At dam	"	9	451	173	Tabellaria 155	223	Protococcus 120	13	Microcystis 13	44	Trachelomonas 20	0	0	220	14.4	333	24.5
Average...........	....		656	206	....	232	....	11	....	199	....	0	15	......	......	491	......
Upper part, opp. point...	Aug.	23	1121	865	Tabellaria 831	105	Staurastrum 56	25	Microcystis 25	78	Chlamydomonas 25	0	50	757	15.6	......	23.0
At dam	"	23	1198	1104	Tabellaria 952	92	Staurastrum 38	0	....	64	Chlamydomonas 24	0	38	305	15.6	......	23.0
Average...........	....		1159	923	....	99	....	13	....	71	....	0	44	......	......	......	......
Upper part, opp. point...	Aug.	26	2307	1916	Tabellaria 1803	311	Staurastrum 181	0	....	30	Chlamydomonas 1 Trachelomonas 28	0	60	675	......	151	24.0
At dam	"	26	2011	1812	Tabellaria 1700	150	Staurastrum 85	0	....	44	Chlamydomonas 26	0	0	520	......	181	23.5
Average...........	....		2159	1864	....	230	....	0	....	37	....	0	30	......	......	141	......

250 pounds copper sulphate added (= 1 part to 5,000,000) on Aug. 26th.

At dam	Aug.	29	1117	889	Tabellaria 795	211	Staurastrum 119	0	....	37	Chlamydomonas 20 Trachelomonas 15	0	30	625	......	......	......

PURIFICATION OF THE ST. LOUIS WATER SUPPLY BY USING FERROUS SULPHATE AND CALCIUM HYDROXIDE AS A COAGULANT, FOLLOWED BY PLAIN SEDIMENTATION.

By Dr. C. A. SNODGRAS,
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Prior to the year 1832, the water supply for the city of St. Louis was obtained from wells. In that year the first water works system was completed, since which time the source of supply has been the Mississippi River, supplemented by wells, there now being of the latter five thousand, one hundred and sixty-two.

It is impossible to say just what proportion of the population depend on these wells for their water supply. From the installation of the first water works system in 1832 until March 22d, 1904, the public water supply for the city of St. Louis was unsatisfactory. Following the custom of most cities in their early history, St. Louis selected as a source of water supply that which was most easily secured and of the least cost, which in this case was the Mississippi River. This supply from a physical standpoint has remained constant and uniform. From that of public health, it has varied.

The changes which have been made in the location of the water works intake have afforded subject matter for all classes of verbose writers who desired to enlighten the public on the subject of contaminated water supplies. Of late, this city's water supply has been of great interest to men who were entitled to an opinion upon the relative and absolute value of water supplies. Many of the ablest men in this country have been connected in a greater or less degree with its investigation.

The motives that have prompted the different investigations may be put into three classes. One group of men desired to prove that the Mississippi River at the water works intake of St. Louis was contaminated, and principally so as a result of the sewage sent down through the Chicago Drainage Canal and the Illinois River to the Mississippi; another group of men attempted to establish the fact that the water supply for the city of St. Louis, if contaminated, was not appreciably so as a result of the Chicago sewage. The third group of investigators were supposed to occupy neutral ground, their aim being the determination of the most satisfactory water supply for the city. Possibly no investigation of a water supply in the world's history has called for a greater outlay of money, nor has had connected with it abler talent. It is not the purpose of this paper to make even the briefest announcement of the findings of the two first named groups of investigators, nor the deductions to be drawn therefrom, and I will mention only the most cardinal facts which came out of the work of the third group. This I will do in order that we may properly approach the subject of this paper.

In recent years it has been generally claimed that the water of the Missouri River was less contaminated and from the character of the suspended and coloring matter which it contains, would be a more suitable water than that of the Mississippi for treatment. Ninety miles southwest of the city of St. Louis is a large spring called the Meramec, this in conjunction with three small streams of the upper Meramec watershed has for a number of years been considered a satisfactory source for the city's water supply. In order to determine the desirability of selecting one of the three above named sources of water supply, the municipal assembly of the city of St. Louis, on June 28th, 1901, approved an ordinance which authorized the mayor to employ a commission of expert hydraulic engineers to investigate and make recommendations upon the same. There were appointed upon this commission, Messrs. Benezette Williams, George Y. Wisner and Allen Hazen.

Messrs. Williams and Wisner submitted a majority report recommending the Meramec or gravity supply. Mr. Hazen gave a minority report recommending the treatment of the Mississippi River water, using the plant then existing which was to be improved and supplemented by adding mechanical filtration. The city authorities were satisfied with the minority report and were considering the early construction of a mechanical filter plant using as a coagulant, sulphate of alumina. As soon as this disposition was made known there arose from the press, medical societies and supposedly reputable chemists the most violent protest. This wide spread and unwarranted prejudice against the use of alum as a coagulant, forced the board of public improvements to look for some other agent. Ferrous sulphate and lime have been used as coagulants in connection with mechanical filters in the cities of Quincy, Illinois, and at Lorain, Ohio. The results shown there were very satisfactory and the city of St. Louis decided to use these chemicals applied in a manner adapted to its then existing supply system. No better description of the construction and management of the coagulating plant can be given than that which was presented by E. E. Wall, Principal Assistant Engineer, Water Works Extension, St. Louis, before a convention of water supply commissioners which convened some months ago in this city. In commenting upon the process as used at Quincy and Lorain, he says: "Only enough lime is added to the raw water to combine with the free carbonic acid (CO_2) in the water and also to replace the iron in the ferrous sulphate ($FeSO_4$) when it is added, forming carbonate of lime ($CaCO_3$) and sulphate of lime ($CaSO_4$), leaving the iron to form a coagulant of ferrous hydrate which oxydizes to ferric hydrate and is caught on the filters together with the suspended matter entangled with it. Only a comparatively small amount of lime is added, while the amount of ferrous sulphate varies from one to three grains per gallon. The effect of this process is to add to the hardness of the water the amount of sulphate of lime produced by the reaction of the lime on the ferrous sulphate and on the free carbonic acid. The chemicals are added for coagulating purposes only, and the purification part of the process is dependent solely upon the filters. The lime is added in the form of lime water in measured quantities and the iron dissolved and added as a solution of constant strength. With the amount of water pumped daily at St. Louis, from sixty to one hundred and twenty million gallons, this method of introducing lime and iron seemed hardly practicable, as it would require enormous storage capacity, especially for lime water. It would also be necessary to install additional machinery to manufacture the lime water. After a great deal of experiment a temporary coagulating plant was built and put in service with excellent results from the start.

This plant has been installed hurriedly and had to be designed to be used in conjunction with the water works as built, and had to fit in and be successfully operated with a set of changes already made for a different scheme, and fully described in "Engineering News" of November 26th, 1903.

The coagulating house is a frame building situated on the river bank over the uptake shaft which connects the river and the inshore tunnels. This building is 48 feet by 144 feet, and has storage bins for sulphate of iron in one end and bins for lime in the other. The scales and mixing tanks are in the central part of the shed.

There are four lime tanks six feet in diameter and three feet deep, each being designed to handle a maximum quantity of 1,800 pounds of quicklime per hour, producing milk of lime carrying from 7,000 to 8,000 grains of lime per gallon. The strength of the milk of lime varies with the quantity of water being treated, as well as the varying amount of water supplied to the tanks. It is not necessary that the solution should be of constant strength since the lime is thrown into the tanks at five minute intervals, the proper amount for each being weighed and varying according to the number of grains of lime per gallon required to be added to the raw water.

The lime tanks are continually supplied with hot water at a temperature of about 120° F. because lime will slake only very slowly in cold water. It begins to slake at once in 120° F., and a charge will be completely slaked in fifteen minutes in the tanks. The lime is constantly stirred by revolving rakes with spring steel teeth. The tanks are made of wood, lined with steel plates, with outlet pipes two feet above the bottom. The milk of lime flows through four inch outlet pipes to a six inch pipe leading to a small collecting tank, from which it is pumped by a centrifugal pump electrically driven, through a six inch cast iron pipe to the delivery well when it mixes with the raw water from the low service pumps.

The collecting tank is three feet by six feet and three feet deep, and has a compartment 18 inches by 24 inches, boxed around the suction pipe of the centrifugal pump. The milk of lime flows into this compartment, the tank proper being supplied and kept at a constant height by a four inch pipe connected to basin No. 1. This pipe delivers a maximum amount of one hundred and forty gallons per minute of cold water which serves to dilute and cool the milk of lime. The small compartment around the suction pipe has openings at the bottom to allow free ingress to the cold water so that there shall be no danger of the pump emptying the compartment. In case of a stoppage of the pump the collecting tank has an overflow into the uptake shaft so that the milk of lime is then introduced into the raw water at that point and passes through the low service pumps. This is objectionable, and is only to be used in case of emergency.

There are two tanks for iron 4 feet by 5 feet and 3 feet deep, supplied with cold water introduced at the bottom of the tanks, through a system of twenty nozzles, each having four one-sixteenth inch openings at the sides, so as to produce a network of small horizontal streams over the bottom of the tank. The ferrous sulphate is put into the tanks in identically the same manner as is the lime. It readily dissolves and overflows from the tanks into a pipe leading down the uptake shaft into the tunnel. No stirring apparatus is needed in the iron tanks and only cold water is used. Each tank will dissolve 1800 pounds of sulphate of iron per hour.

It is evident that by this process a certain definite amount of both lime and iron can be added to the raw water at a constant and unvarying rate, without any regard to the quantity of water used in making the solutions, providing always that enough water is supplied to dissolve the iron and to slake the lime as rapidly as it is thrown into the tanks. An excess of water will have no practical effect on the result.

The quantity of lime added to the water supply of St. Louis has varied from four to nine grains per gallon, due to the changing condition of the raw water. Sulphate of iron has been added in varying quantity, from one-half to three grains per gallon.

The coagulating plant was started March 22nd, 1904, and during a period of one hundred and forty-seven days from that date to August 15th, 1904, 4275 tons of lime were used, an average of 29.9 tons per day amounting to an average of less than 5 grains per gallon. During the same period, 1359 tons of sulphate of iron were used, an average of 9.5 tons per day, nearly 1.5 grains per gallon. The river began rising about March 6th, 1904, and remained at a very high stage until July 20th, 1904, necessarily requiring heavy amounts of coagulant for clarification.

The amount of water treated daily has not been less than sixty million gallons and has reached as high as one hundred and twenty millions daily. The cost of operating the coagulating plant for a period of one hundred and forty-seven days, the time upon which the costs were determined, has been $3.20 per million gallons. This cost was based upon the treatment of the water from March 22nd, 1904, to August 15th, 1904, during the months when our water supply contained much suspended matter.

The commissioner of water supplies has informed me that the average cost per million gallons for the year will be much less than $3.20 per million gallons and that with improved methods, improved machinery and a more flexible system of sedimentation, the cost will still be reduced.

Let us compare the cost of supply as recommended by the majority and minority of the committee of hydraulic engineers for the schemes which they thought best for the city to adopt with the one now being used.

The gravity plan as recommended by Messrs. Williams and Wisner called for an original outlay of $31,000,000, which added to the cost of operation for 54 years would make the average cost per million gallons $23.30. Another estimate which they gave placed it at $26.00 per million gallons. They estimated that if the pumping plant be used the cost would be $29.46 per million gallons with an original outlay of $2,700,000.

Mr. Hazen gave a somewhat lower estimate for mechanical filtration. Making the simplest comparison possible the present cost of maintaining the river works independent of any treatment would be about $12.00 per million gallons. Add to this $7.43 the cost of operating filters and you have $19.43. With our present system taking the same figures, $12.00 per million gallons for maintenance without treatment plus $3.20 per million gallons for the ferrous sulphate and lime treatment and you have $15.20 per million gallons, a difference of $4.20 per million gallons in favor of our present system.

The original cost of the coagulating plant was $10,000, against $31,000,000 for the proposed gravity system, and $2,700,000 for the proposed mechanical filtration system.

You are now ready to ask what are the physical properties, also the chemical and bacterial content of the water which our system is supplying to the consumer. The treatment being used, transforms a muddy and highly colored water into a clear, colorless, odorless and tasteless water. Other physical properties are shown by chemical analyses to be as follows:—

Lime and Iron Grains per Gallon.	$CaSO_4$	$CaCO_3$	$MgCO_3$	Suspended Solids.	Dissolved Solids.	Alkalinity.
June 30th.						
Raw	63.30	45.50	34.02	3763.	206.4	109.2
Treated 9. 2..........	63.30	21.46	14.89	32.5	148.	38.6
July 31st.						
Raw	55.50	31.80	33.80	1694.2	200.8	122.
Treated 7. 3..........	76.10	....	7.12	43.6	144.4	42.

These results were obtained by the water works chemist. I have read only the analyses of two weeks which is a fair representation of all the other analyses. These were made during the high water in June and July, 1904.

This work is done entirely independent of the board of health. In order to have some knowledge, furnished by its own officers of the city water supply, in the month of February Dr. H. Wheeler Bond, a member of the board of health, had a resolution passed which called for a weekly analysis of the water supply by the city chemist and the city bacteriologist. The samples to be taken at four different points; which were the intake tower, the distributing well, the outlet chamber and the laboratory tap. The city chemist's report shows that the permanent hardness is not materially increased by the addition of the coagulant, but that the temporary hardness is markedly decreased. That part of the chemical analyses to which we would invite your attention, is the removal of suspended solids as shown by the following table.

BEFORE COAGULATION.

Week commencing	Suspended Solids in Water from Distributing Well.	Suspended Solids in Water from Outlet.	Suspended Solids in Water from Office Tap.	Percentage Removal of Solids Between Distributing Well and Outlet.	Percentage Removal of Solids Between Distributing Well and Office Tap.
Feb. 29th.	273	154	110	43.5	59.7
Mch. 14th.	475	152	105	66.0	77.9
Average				55.8	68.8

AFTER BEGINNING OF COAGULATION, MARCH 22, 1904.

Week commencing	Suspended Solids in Water from Distributing Well.	Suspended Solids in Water from Outlet.	Suspended Solids in Water from Office Tap.	Percentage Removal of Solids Between Distributing Well and Outlet.	Percentage Removal of Solids Between Distributing Well and Office Tap.
Mch. 28th.	3494	227	160	93.5	95.4
Mch. 28th.	2137	89	160	95.8	92.0
Apr. 4th.	695	64	137	90.8	80.3
Apr. 11th.	1490	55	51	96.2	96.5
Apr. 11th	2480	59	51	96.3	97.9
Apr. 18th.	3211	279	53	91.2	98.3
Apr. 25th.	2842	97	106	96.6	96.2
May 2nd.	1727	78	68	95.5	96.1
May 9th.	1523	23	47	98.5	96.2
May 16th.	608	33	129	94.6	78.3
May 23rd.	1431	55	43	96.1	90.0
May 30th.	4048	57	43	98.8	98.9
June 6th.	3076	39	30	98.7	99.0
June 17th.	3187	13	43	99.6	98.6
June 24th.	3562	47	47	98.7	96.7
July 1st.	4019	49	58	98.8	98.5
July 8th.	2975	63	69	97.9	97.7
July 15th.	2419	47	35	98	98.6
July 22nd.	1606	16	31	99	98.1
July 29th.	1651	42	68	96.9	95.9
Aug. 5th.	1719	38	44	97.8	97.4
Aug. 12th.	1356	42	33	96.9	97.6
Aug. 19th.	1500	67	17	97.5	98.9
Aug. 26th.	1778	34	13	98.1	99.2
Sept. 2nd.	1282	35	25	97.3	98
Sept. 9th.	1273	22	19	98.3	98.5

AFTER BEGINNING OF COAGULATION, MARCH 22, 1904 — Concluded.

Week commencing	Suspended Solids in Water from Distributing Well.	Suspended Solids in Water from Outlet.	Suspended Solids in Water from Office Tap.	Percentage Removal of Solids Between Distributing Well and Outlet.	Percentage Removal of Solids Between Distributing Well and Office Tap.
Sept. 16th.	1052	12	13	98.9	98.8
Sept. 23rd.	....	8	2	....	....
Sept. 30th.	1762	22	19	98.8	98.9
Oct. 7th.	1128	12	....	98.9	....
Oct. 14th.	954	29	20	97.5	97.9
Oct. 21st.	1130	10	....	99.1	....
Oct. 28th.	660	7	6	98.9	99.1
Nov. 18th.	612	18	148	98.6	75.6
Nov. 25th.	537	24	13	95.5	97.5
Average	....	....	....	96.9	95.4

To those who determine and adjust the chemical changes which occur in the treatment of a water supply, the following will be of interest:

"To clearly indicate the chemical action of ferrous sulphate and lime upon the Mississippi River water, it is necessary to note the principal salts in solution, upon which the ferrous sulphate and the lime act. These are bi-carbonate of lime and bi-carbonate of magnesia, besides which there is a small amount of free carbonic acid and some sulphate of lime, which last remains unchanged — a small amount of sulphate of lime being added from the action of the ferrous sulphate on the bi-carbonate in solution.

First, when the ferrous sulphate ($FeSO_4$) is added to the river water, it combines with a portion of the bi-carbonate of lime to form ferrous bi-carbonate and calcium sulphate, thus:

$$FeSO_4 + CaH_2(CO_3)_2 = FeH_2(CO_3)_2 + CaSO_4.$$

Then the water contains the following substances in solution, which are acted upon by the calcium hydrate (milk of lime), producing the following reactions:

(1) $CO_2 + Ca(OH)_2 = CaCO_3 + H_2O.$

(2) $CaH_2(CO_3)_2 + Ca(OH)_2 = 2CaCO_3 + 2H_2O.$

(3) $FeH(CO_3)_2 + Ca(OH)_2 = 2CaCO_3 + Fe(OH)_2\ 2H_2O.$

(4) $MgH_2(CO_3)_2 + 2Ca(OH)_2 = 2CaCO_3 + Mg(OH)_2 + 2H_2O.$

The ferrous hydrate $Fe(OH)_2$ remaining in the water oxydizes into ferric hydrate, thus:

$$2Fe(OH)_2 + H_2O + O = Fe_2(OH)_6$$

The normal carbonate of lime ($CaCO_3$) is insoluble and crystallizes about the particles of suspended matter and on the flocculent precipitate of ferric hydrate which also entangles the portions of suspended matter and serves to drag the whole mass of matter in suspension.

The hydrate of magnesia precipitated by reaction (4) will settle out of the water slowly. It is insoluble, but as the water absorbs carbonic acid gas from the air, the magnesia hydrate will be gradually converted into magnesia bi-carbonate and enter into solution again, only a part of the original bi-carbonate of magnesia being removed by the treatment."

In the near future the settling basins will be increased in number and the time allowed for sedimentation extended from thirty to forty-eight hours to fifty to seventy-two hours. In the agitation caused by passing the water from one basin to another over a system of weirs, for the purpose of aeration, the original precipitate which has been bound together by the normal carbonate of lime crystalizing about the suspended matter, and the flocculent precipitate of ferric hydrate is broken up, will not settle out again. This can be corrected by allowing the water to flow into a basin and remain undisturbed.

You will say that I have not yet produced the evidence of a safe water supply. The result of bacterial analysis is as follows:—

BEFORE COAGULATION.

Week commencing	Number of Bacteria in River Water.	Number of Bacteria in Outlet Water.	Number of Bacteria in Tap Water.	Percentage Removal of Bacteria Between River Intake and Outlet.	Percentage Removal of Bacteria Between River Intake and Tap.
Feb. 29th.	18,500		6,500		65
Mch. 18th.	23,000	665	5,750		75
Average					70

AFTER BEGINNING OF COAGULATION, MARCH 22nd.

Week commencing	Number of Bacteria in River Water.	Number of Bacteria in Outlet Water.	Number of Bacteria in Tap Water.	Percentage Removal of Bacteria Between River Intake and Outlet.	Percentage Removal of Bacteria Between River Intake and Tap.
Mch. 28th.	19,000	8,700	937	55	91
Apr. 1st.	187,500	....	9,200	....	95
Apr. 22nd.	34,000	8,225	1,550	76	95.5
Apr. 29th.	136,500	2,850	3,950	98	97
May 6th.	22,500	1,800	550	92	98
May 13th.	103,500	37,500	16,250	64	85
May 27th.	45,000	600	750	99	98
June 3rd.	30,000	3,500	600	89	98
June 10th.	24,000	1,100	2,000	95.5	92
June 17th.	16,000	550	500	97	97
June 24th.	38,000	1,600	650	96	98
July 15th.	26,000	4,300	323	84	98.8
Aug. 12th.	27,000	2,500	1,100	91	96
Aug. 15th.	14,000	3,200	1,550	77	89
Aug. 19th.	10,575	450	590	96	94.5
Aug. 26th.	9,150	300	30	97	99.6
Sept. 2nd.	2,100	200	20	91	99
Sept. 9th.	17,750	....	75	....	99.6
Sept. 16th.	11,275	4,550	600	60	95
Sept. 23rd.	14,375	300	375	98	97.5
Sept. 30th.	25,475	300	55	99	99.8
October	....	....	....	....	....
November 18th.	8,125	300	950	97	89
Nov. 25th.	40,000	6,100	1,000	85	76
Average	....	....	....	87.4	94.7

On page 240 of the Louisville report the total averages of bacterial removal for the Warren filter is 96 per cent efficiency; for the Jewell filter, 96 per cent efficiency. In the Cincinnati report, pp. 32-39, the bacterial efficiency of that investigation ranged between 95 and 98.8 per cent. The combined efficiency obtained at Pittsburg with the Warren and Jewell filters was not over 96.8 per cent. Experiments made at Washington upon the Potomac River gave efficiencies averaging from 80 to 99.9 per cent. In the light of these facts, it is not probable that St. Louis will entertain a proposition for the installation of a mechanical filtration plant, the efficiency of which is no better than those now being used in other cities.

The people of St. Louis are satisfied with the water which is being supplied. The purified water was thrust upon them before they were aware of the contemplated treatment. We have abundant evidence from manufacturers and those having the care of boilers, which shows the treated water to be satisfactory to them in the extreme.

The majority report of the commission of hydraulic engineers prophesied the most disastrous results from the incrusting constituents and corrosive effect of a water treated for mechanical filtration. With our present system nothing of the kind has occurred. This same majority report, page 31, is as follows, "First and most important is the fact that there is nothing to show what the results obtained by such filters are, relative to disease germs.

It is generally assumed that pathogenic bacteria will be removed in the same proportion that applies to ordinary water bacteria, but there is little or no evidence upon which to base this assumption." These experts would say the same of the system which we are now using. It would be unreasonable to say that the space value of a pathogenic organism would differ from that of a non-pathogenic. This is a question of size, not pathogenisis.

Our data is too meager for the epidemiologist to work upon, however, there is a much lower death rate from typhoid fever in St. Louis this year than there was last.

It would be unwise to claim that this new method of water purification would be suitable for the treatment of all water in the future, but it is highly indicative of what is possible in handling the waters of the Mississippi Valley and those of a similar character.

THE USE OF SULPHATE OF COPPER ALONE, AND IN COMBINATION WITH LIME FOR THE DESTRUCTION OF MOSQUITO LARVAE — AS A DEODORANT AND AS A DISINFECTANT.

By Dr. A. H. DOTY,
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Sulphate of copper has occupied an uncertain position in sanitation inasmuch as its value has been differently estimated in various parts of the world. This has been largely due to the absence of satisfactory scientific investigation. It was for the purpose of securing some definite and reliable information regarding this agent that a series of experiments were begun early in this year at the New York Quarantine Station. The investigation covered the following points:

(1) The use of copper, alone, or in combination with lime for the destruction of mosquito larvae.

(2) As a deodorant.

(3) As a disinfectant.

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In the tests employed to ascertain the value of copper for the destruction of mosquito larvae every effort was made to carry out the work in a practical and thorough manner. Superficial wooden tanks divided into two parts were constructed for this purpose, each part having a capacity of fifty gallons; to these tanks was carefully transferred water containing mosquito larvae taken from pools in districts where this insect was actively propagated. While both sections of the tank were filled with water containing the larvae, the experimental work, i. e., the addition of copper, or copper and lime was confined to one section only, the other being used simply as a control to ascertain the length of time the larvae remained alive in the water not treated with the agents above referred to. In some of the experiments decomposed meat or fish, sewer water or some other offensive fluid was added to the original pool water in both sections of the tank. This was done to increase the amount of organic matter present in order to ascertain the action of copper and lime in various solutions and also to learn in what kind of fluids the larvae thrived best. Three stock solutions were used in the experiments. Number 1, consisted of one pound of copper to ten gallons of water; number 2, one pound of lime to ten gallons of water; number 3, one pound of copper and one pound of lime to ten gallons of water. A gallon of one of the above solutions was added to every fifty gallons of water containing larvae experimented with. This constituted about twelve grains of sulphate of copper for each gallon of water tested and an equal amount of lime when this agent was used. It was shown early in the experimental work that so far as the destruction of larvae was concerned, the use of copper alone was less effective than when used in combination with lime. This was also apparent in the tests made with copper to ascertain its value as a deodorant. Numerous experiments were made with weaker and stronger solutions of copper and lime than those already referred to; however, it was proven by these tests that the mixture containing one pound of copper and lime and ten gallons of water offered the best and most constant result.

The larvae contained in the portion of the tank in which the copper and lime alone or in combination were added very soon became inactive and by the end of twenty-four to thirty-six hours a large per cent of them were dead. It is important to know that while this change took place in the portion of the tank containing the copper and lime, the larvae contained in the other portion of the tank remained active and passed into the pupal stage and subsequently became the winged insects. As already stated this portion of the tank was used only as a control.

Immediately after the introduction into the tank of the copper or lime, or both the water became turbid and a precipitation began which continued for a number of hours. The result was striking even in tanks where sewer water, or decomposed meat or fish had been added. At the end of eight or ten hours in almost all of the tests, the water became beautifully clear. Chemical examination made at the end of twenty-four hours failed to detect the presence of copper in the clarified water. The precipitation and the destruction of larvae referred to followed the introduction of either copper or lime alone, but it was much more pronounced when they were used in combination. An explanation of the above may be given as follows: When water is added to calcium oxide (unslaked or rock lime), the oxide is converted into calcium hydrate. On the addition of this to a solution of copper sulphate a reaction takes place which forms copper hydrate and calcium sulphate. The copper hydrate, being insoluble in water forms a precipitate; the calcium sulphate present if more than sufficient to saturate the water will also form a deposit. When copper alone is used the precipitate is as a rule due to the combination of the copper with the lime as a normal constituent of the water. When lime is added with the copper the precipitate is necessarily more pronounced. This change involves a chemical and mechanical combination with the organic matter present which is carried down with the precipitate. It is in this manner that the organic matter is removed from the water which practically means the abstraction of the nourishment upon which the larvae unquestionably live. After the addition of lime and copper to the water, the larvae die slowly and some succumb sooner than others. As has already been stated the precipitation and the destruction of larvae followed the introduction of either copper or lime alone, but was more pronounced when they were used in combination. As proof that the larvae were not killed by a toxic effect of the copper, the following tests are presented. Larvae placed in distilled water which contained no organic matter, and to which no copper or lime was added lived but a short time. Furthermore it was shown in the tests made in the tanks, that if a very large amount of organic matter was added to the water experimented with, so much that the copper and lime could only precipitate a portion of it, the larvae were not materially affected. It was found that the use of lime, which causes a precipitation equal to that produced by copper killed the larvae as quickly as when copper was used. In connection with this part of the subject it may be said that experiments in this direction were made with sulphate of iron and alum alone and in combination with lime. These agents however did not produce the satisfactory results noticed when copper and lime were employed.

A careful study of the experiments just cited leads to the conclusion that the destruction of larvae in water to which copper or lime, or both have been added is due to the rapid removal of nourishment rather than from any toxic effect produced by these agents.

In the second series of experiments, i. e., to ascertain the value of copper as a deodorant, many tests were made with various forms of offensive matter both fluid and solid including decomposed meat and fish, sewer water containing fecal matter, etc., etc. The same solutions were used as in the experiments made with mosquito larvae. The experiments showed that although copper acted as a deodorant it was not so uniformly successful as when used in combination with lime. In water made very offensive by adding organic matter from sewers or decomposed meat or fish, the valuable deodorizing qualities of copper and lime were very apparent. Less than half an hour after the addition of these agents there was but little or no odor perceptible. This result was as a rule permanent and only in a few instances was it necessary to make a second application. The deodorizing and clarifying effect of copper and lime on offensive and turbid water is remarkable and can only be fully appreciated by those who have witnessed the experiment. The effect of the mixture on offensive receptacles and apartments, such as pails, barrels, vaults, cess-pools, cellars, stables, etc., etc., is pronounced and exceedingly satisfactory. This result also follows the liberal use of the mixture of copper and lime on garbage heaps, etc. where organic matter has been in process of decay for a long time and where the odor is very obnoxious. The use of the mixture in the latter instance may be regarded as a severe test. In some few instances it was found that the decomposed organic matter present was in such large quantities that the amount of copper and lime usually employed for the purpose was not quite sufficient to produce the desired result. In these cases an additional half pound of lime was used, thus making the formula one pound of copper and one and a half pounds of lime to ten gallons of water. As a matter of fact even more copper and lime than this may be used if it is deemed necessary. However, the formula generally used (one pound of copper, one pound of lime and ten gallons of water) was as a rule found to be sufficiently strong to deodorize the offensive matter with which it was brought in contact. It must be remembered that in deodorizing solid masses that the mixture is used in full strength, whereas in deodorizing offensive fluids one gallon of the mixture is added to from thirty to fifty gallons of the fluid treated.

The need of a practical and effective deodorant has long been fully appreciated by sanitarians. A true deodorant is one which destroys offensive odors by neutralizing them and not by masking them with a stronger odor. But very few good practical deodorants are at our command. The use of the preparations of lime in powder although commonly employed are not satisfactory neither is any deodorant in the form of powder applicable to general use for the reason that it does not insure an intimate mixture with offensive material. The difficulty in securing good results from the use of deodorants in this form is illustrated in attempts to deodorize masses of garbage, etc., in which instances only a portion of the material can be treated as the powder cannot be properly applied to all parts of the mass. Bromine has for the past ten or fifteen years been regarded as the best deodorant in use, and justly so; however, the employment of this agent is associated with considerable danger inasmuch as it violently irritates the respiratory tract, so much so that in making solutions of it for deodorizing, it is necessary to break the bottles containing the bromine under water. On the other hand both copper and lime are practically harmless and their use is attended with no danger; besides, they are comparatively very cheap. Sulphate of copper can be purchased for five cents per pound and lime for three cents per pound. A ten gallon solution therefore can be made for eight cents. When we consider that a gallon of this mixture will deodorize and clarify thirty to fifty gallons of offensive and turbid water, or in its full strength deodorize a considerable mass of decomposed solid matter, it will be seen that very little expense is attached to its use. Again in contrasting bromine with copper and lime, it will be found in treating decomposed organic matter that the effect of bromine which is very volatile is transient and frequent applications must be made to prevent the recurrence of offensive odors. On the other hand a single application of the mixture of copper and lime is generally sufficient; more than two applications are rarely needed. This factor alone is of great practical importance.

Sulphate of copper has a strong affinity for sulphur, forming with it insoluble sulphides. Therefore the value of this agent as a deodorant is largely due to this fact, inasmuch as the offensive odor emanating from decomposed animal and vegetable matter is commonly caused by the formation of sulphur compounds.

In the use of copper and lime, it must be borne in mind that when these agents are mixed together a precipitate takes place. This contains the important deodorizing elements and it is imperative that the mixture should be well stirred when being applied. Care must be taken in selecting the copper and lime and in preparing the mixture in order to secure a satisfactory result. Fortunately sulphate of copper, commonly known as "blue vitriol" is so cheap that it does not invite adulteration, but it is sometimes confounded with "copperas" (sulphate of iron). Chemically the lime used in the preparation is called calcium oxide, but is commonly known as "unslaked" or "rock lime." It is purchased either in barrels or tin cans, the latter being preferable as it better insures protection against the air, although if properly protected in barrels, or large receptacles, the result is practically the same. Lime which has been exposed to the air, and is known as "air slaked" lime is worthless for this purpose. The unslaked, or rock lime used in this mixture must not be confounded with chloride of lime. In preparing the mixture which I have recommended as a deodorant, and which is composed of one pound of copper, one pound of lime and ten gallons of water, it is advisable to first dissolve the copper by placing it in a linen or muslin bag suspended by a string just below the surface of the water. In this way it is dissolved much more rapidly than when the copper is thrown to the bottom of the receptacle and stirred. For example, the copper may be dissolved in six or eight gallons of water, leaving the remainder of the ten gallons to prepare the lime which is done by placing the latter dry in a pail, or other receptacle and gradually adding water and stirring until the "steaming" or "slaking" is completed. The lime is then gradually added to the water in which the copper has already been dissolved, the mixture being constantly stirred during this time — a precipitate then takes place. In a well covered receptacle the mixture may be kept indefinitely as a stock solution.

In the treatment of offensive masses such as decomposed organic matter, garbage heaps, offensive woodwork, vaults, etc., etc., no complicated apparatus is necessary for the application of this mixture. An ordinary garden sprinkling pot, made of tin, and of a large size having a strainer at the end of the nozzle is all that is needed for this purpose. This mechanically distributes the mixture. As the latter is rather thick, it is best to enlarge the small openings in the strainer by inserting an awl, or some smooth and round instrument. This allows a freer exit of the mixture. In deodorizing offensive solutions the sprinkling pot is not needed as the mixture is simply added in the proportion of one gallon to thirty to fifty gallons of the fluid to be treated. The mixture of lime and copper will more or less adhere to the various receptacles. However, if it is desired, it can, after a sufficient exposure be easily removed by a stream of water. In cellars, etc., the mixture may be applied with a whitewash brush. However, for offensive woodwork the employment of the sprinkling pot is preferable. A severe test for the mixture may be found in stables where the ammoniacal odor is very strong and pungent, particularly where urine-soaked floors exist. The good effect of the mixture in these cases is apparent within an hour after its application. The solution of copper alone or in combination with lime so far as my experiments have shown has no effect upon or does not discolor white or linen or cotton goods soaked in this mixture for six or eight hours. At the end of forty-eight hours some slight greenish discoloration in streaks was noticed however. This discoloration was quickly removed by warm water and soap. As a matter of fact, to deodorize material of the kind just referred to it is only necessary to let it remain in the mixture for two or three hours at the most.

Experiments to determine the germicidal value of sulphate of copper are now under way in the laboratory at this station. Thus far I am able to report the following:

In tests made with typhoid bacilli in distilled water, tap water, water from sewers and broth, it was found that in distilled and tap water, a solution of 1-10,000 killed in one hour. In distilled water a 1-100,000 solution killed in two hours, while in tap water it required from six to eight hours to produce the same result. In water taken from street sewers, a 1-1000 solution was required to kill typhoid bacilli in one hour, while in broth it required a 1-300 solution for this purpose. It is of importance to note that in these experiments a greater amount of copper was required as the organic matter was increased in the fluid. In tests made with the cholera organisms, it was shown that they succumbed in a much higher solution and more promptly; for instance, a 1-10,000 solution in distilled water killed the cholera organisms in twenty minutes, while it required one hour to effect the destruction of the typhoid organism. It was also shown that a 1-200,000 solution killed the cholera organism in two hours. I have simply cited the above experiments relative to the germicidal effect of copper to suggest what the possibilities of this agent may be as a disinfectant. This part of the investigation will be exhaustively carried out and the result when completed will be published in detail.

In summing up the value of copper alone and in combination with lime, under the three headings given at the beginning of this article, I can state as the result of my experimental work, that in the destruction of mosquito larvae, and as a deodorant, the use of copper in combination with lime is more effective than when used alone. That this mixture destroys mosquito larvae by rapidly removing from the water in which they are contained the organic matter or nourishment upon which they depend for life, and that this result is not due to a toxic effect produced by the copper or lime. Therefore the range of usefulness of these agents either alone or combined in the destruction of mosquito larvæ is limited. In swamps or bodies of water covering large areas where fresh water and organic matter are constantly being added, the use of the mixture is hardly practicable and its value in these instances is not very apparent. However, in collections of stagnant and offensive water, where the mosquito larvae are frequently found in enormous numbers the mixture of copper and lime is of great value, inasmuch as it not only destroys the larvae but deodorizes the offensive fluid. In swamps, etc., where there is usually but little sunlight and where there is the most active propagation of the mosquito, there is no doubt as to the superiority of petroleum not only for the destruction of the larvae but in driving away the winged insects. I desire to be emphatic in the statement that I suggest the use of copper and lime, or petroleum only, when it is impossible to carry out the scientific and radical measures for the extermination of the mosquito, i. e., proper drainage and the observance of the laws of modern sanitation.

In regard to the use of a mixture of copper and lime as a deodorant, I believe it to be the most valuable and practical agent we possess at present for this purpose. Its action as a deodorant is rapid and permanent, it is practically harmless, cheap and easily made, and seems to comply with the requirements of a typical deodorant. Furthermore, its range of usefulness is extensive, as it can be employed equally well for deodorizing solids or fluids.

As I have already stated, but little can be said at the present time regarding the germicidal value of copper. However, it is likely that the publication of the results of the investigation regarding this agent, which is now being carried on in different laboratories in this country will furnish valuable information in this direction.

REPORT OF COMMITTEE ON DISINFECTION AND DISINFECTANTS.

By Prof. F. C. ROBINSON, Chairman, Brunswick, Me.

The Committee, in accordance with its custom for several years, constructs its report as a review of the more important literature on the subject during the past year especially in the foreign journals. We think that thus a bibliography is gradually made which will be of permanent value. No attempt is made to abstract fully the articles, but to call attention to their contents simply, note salient features, and comment very briefly upon them. We think it will be easy in all cases to distinguish our comments from the subject matter of the articles. The matter is treated in chronological order very nearly, beginning with a few articles overlooked last year.

Boston Medical and Surgical Journal, Vol. 148. No. 7. 1903. "Antisepsis of clinical thermometer." Devine. Recommends a separate instrument for each case if possible, otherwise keeping in the thermometer case a solution of bichlorid in alcohol 1-2000.

Centralblatt fur Bakteriologie, Vol. 32 No. 23. Feb., 1903. "The action of water vapor containing formalin." Review of an article by Esmarch giving results of experiments to disinfect by use of steam containing small percentage of formaldehyde. He found the disinfecting power of such vapor much greater than of steam alone. With 1% formalin anthrax spores were killed in 5 minutes, even in cloth packets and furs. A temperature of from 70°-80° was obtained which would not injure leather or hair goods. He recommends 2% formalin and 20 minutes duration of the action as absolutely safe for sterilization.

Revue d'Hygiene, Vol. 25. No. 2. Feb., 1903. "Antiseptic value of lysol." Hautefenille. He found by experiments that while a 1% solution of lysol will check the development of bacteria and kill many after acting upon them for twelve hours, a 4% solution will sterilize the most difficult things, including tuberculosis matter, in twelve hours.

Hygienische Rundschau, Vol. 13. No. 5. March., 1903. "Experiments on disinfecting railway cars by formaldehyde." The results showed that in case of passenger cars, it was practically impossible to completely sterilize all parts by the vapor of formalin, but still the experimenters think that it is the most practical thing to employ for that purpose. They recommend 1000 c.c. of the iquid formalin to each car, but of course the cars are much smaller than those we use in the United States.

Centralblatt fur Bakteriologie, Vol. 33. No. 7. March 20, 1903. "Certain formalin preparations as disinfectants." Kokubo. He compared lysoform or septoform and formalin soap containing 10% and 25% formalin with carbolic acid. He concluded that both formalin preparations were much more destructive towards anthrax than carbolic acid, for the spores lived in a 3% carbolic acid solution for 25 days, while a 50% solution of formalin soap killed them in 25 minutes. But upon typhoid, streptococcus, and staphylococcus the carbolic acid solution was slightly more active than they.

Hygienische Rundschau, Vol. 13. No. 6. March 15, 1903. "The disinfecting action of a mixture of water vapor and formaldehyde and carbolic acid." Eugen Meyer. He shows that while, according to Esmarch, a mixture of formaldehyde and steam acts as a strong disinfectant at from 70°-80° a little carbolic acid vapor with them causes an equal efficiency at about 5° lower temperature, namely 65°-75°.

Centralblatt fur Bakteriologie Vol. 23. No. 7. March 20, 1903. "Concerning disinfection by vapors." C. Eijkman. He explains the greater disinfecting action of vapor than the boiling liquid that gives it off on the ground that such vapor acts on dried bacteria a good deal as it does on a dry powder of a soluble salt, that is, soaks into it and gives up its heat to it really making it locally hotter than the vapor that heats it. Just as steam at 100° passed into salt and water at the same temperature will raise the solution temperature several degrees.

The Journal of State Medicine (London) Vol. 11. No. 5. May 1903. A review of the experiments of Bang, confirming those of Smith that a temperature 65°C. for 5 minutes renders tuberculosis milk incapable of giving tuberculosis. Heating to 60° for 20 minutes has the same effect.

Revue d'Hygiene, Vol. 25. No. 5. May 20, 1903. "The value of sulfurous acid as a disinfectant." Calmette and Rolants. They show again what has been proved so many times before that sulfurous acid made by burning sulfur, when present in a room in not less than 8 parts per 100, will destroy the more easily killed bacteria, including streptococci and typhoid, but is not certain to kill diphtheria, tubercle, or spores of anthrax.

Centralblatt fur Bakteriologie, Vol. 23. No. 17. July 31, 1903. "Carbollysoform." Ellsner. This is a mixture of ⅔ lysoform and ⅓ carbolic acid. It has little or no odor and is less poisonous than carbolic acid. A 5% solution of it equals in disinfecting power a 3% solution of carbolic acid. Lysoform is a mixture of lysol and formalin.

Zeitschrift fuer Hygiene und Infectionskrankheiten 2d part, 1903. Vol. 42. "Sterilization of water by ozone." Proskauer and Schuder.

They give the results of their experiments with the purification plant at Schierstein on the Rhine. These in general confirm their own previous experiments and those of others and convince them that it is a safe and economical method to render a water supply suitable for drinking.

Public Health, London, Vol. 15. No. 10. July, 1903. "Chemical methods for sterilizing drinking water." V. B. Nesfield. Recommends the use of tablets made from 1½ grains bleaching powder and ½ grain sodium bicarbonate. He claims that these will each sterilize a pint of water in five minutes, or better, ten. He removes the taste of chlorine by adding a tablet of sodium sulfite. He claims that by such use the most foul river water is made free from disease germs and palatable. It is easier to believe the first part of the claim than the last.

Medical News, New York. Vol. 83. No. 9. Aug. 29, 1903. "Purification and sterilization of water." Mellire. Recommends addition of hydrogen peroxid 5 c.c. to liter, or of potassium permanganate sufficient to give a red tint permanent for an hour at least. Excess of peroxid can be neutralized by a few drops of permanganate solution and *vice versa.* He also says that four drops of tincture of iodin will sterilize a liter of water within one-half hour, and not give a bad taste to the water.

Centralblatt fur Bakteriologie, Vol. 33. No. 21. Sept. 5, 1903. "Disinfecting and preserving substances." Kausch. Contains a list of such substances which have been patented in different countries, with their composition, preparation, and use. A very valuable article for reference. Not only does it give the composition of the common disinfectants but of the uncommon. Those who have to examine foods for preservatives as well as those who use disinfectants in contagious diseases can get much help from this article. Especially valuable is the part which deals with how to make the essential oils odorless and tasteless without destroying their action as bactericides. It brings out the fact not generally known that formaldehyde will dissolve slightly in petroleum, benzene, and other hydrocarbons and the solution forms an excellent disinfectant for floors, wood, etc. If a little soap be first dissolved in the hydrocarbon a much larger percentage of the formaldehyde is dissolved. It shows that the heavier oils and fats will dissolve formaldehyde also. For example, lanoform is made by heating for several hours on the steam bath 1 part 40% formaldehyde solution and 4 parts wool fat.

Journal of State Medicine, London, Vol. 11. No. 9. Sept., 1903. "Germicidal action of alum on typhoid bacillus." Willson. His experiments show that "although alum is a valuable agent for purifying water and for getting rid of ordinary water organisms it is of no value as an agent for the destruction of typhoid germs."

Medical News, New York, Vol. 83. No. 16. October 17, 1903. "Sublamin in the treatment of parasitic diseases." Gottheil. Sublamin is a combination of mercuric sulfate with ethylendiamin, and the article claims that it is less poisonous and more effective than bichlorid.

Hygienische Rundschau, Vol. 13. No. 21. November 1, 1903. "On the methods of testing disinfectants." Franz Ballner. The author's experiments show that the loop culture method of testing a disinfectant does not give accurate results. For example, he found that while a 1% solution of hydrochloric or sulfuric acid appeared to sterilize a bouillion culture of typhoid in 5 minutes, if the tests were made by taking out one or two loops of the material, yet if the acid was neutralized in the whole culture, 100 c.c. in amount, and more bouillion added and the whole incubated, growths were obtained even after 2 hours of action of the disinfectant. By the same method he found that a 2% solution of the same acids failed to sterilize a typhoid culture after acting ½ hour, and that it required a 2% solution of bichlorid of mercury acting for 15 minutes to completely sterilize a culture of staphylococcus, instead of a ¼% solution doing it in ½ minute as is the result when the common loop method of testing is used.

These results are of great interest, even thought they but confirm what thinking men have long believed, that sterilization of large spaces whether containing air or water is a much more difficult thing to accomplish than many suppose, and that the proved destruction of a few cultures in such spaces does not prove that all are destroyed.

Public Health, London, Vol. 16. No. 2. November, 1903. "Purification of drinking water in the field." An iodine method is described, applied in the form of tabloids, of which three kinds are suggested, colored blue, red, and white, respectively.

The blue ones contain

Iodide of potassium	.1 gram.
Iodate of sodium	.0156 gram.
Methylene blue, sufficiency.	

The red ones contain

Tartaric acid	.1 gram.
Fuchsin, a sufficiency.	

The white ones contain

Hyposulfite of sodium	.116 gram.

A red and blue tabloid is added to a quart of water and, after ten minutes, a white one. The first two result in liberation of iodine, which acts as a disinfectant, and is in turn neutralized by the hyposulfite.

No proof is given that the claimed sterilization results, but the theory is good and the "medication not dangerous, although not attractive.

Hygienische Rundschau, Vol.' 13, No. 24. December 15, 1903. "Action of alcoholic solutions of disinfectants." Engle. His conclusion is that with a single exception, which is not given, such solutions have a slightly superior bactericidal action to corresponding water solutions. The exception is undoubtedly carbolic acid.

Journal of State Medicine, London, Vol. 11. No. 1. January. 1904. "Standardization of disinfectants." Smith and Sommerville. Give a few experiments tending to verify the "disinfection coefficients" suggested by Rideal and Walker. The suggestion is to take some disinfectant as a standard and refer all others to this. Carbolic acid 1-80 was used as the standard. For example, creoline diluted 1-1280 was found of the same efficiency as the standard upon cultures of typhoid, hence the coefficient of carbolic acid compared with creolin is 16.

Such standardization will be helpful if used intelligently, but the factors which enter into the action of a disinfectant are so many and variable that there is a danger in all such mathematical statements.

Boston Medical and Surgical Journal, Vol. 150. No. 2. January 14, 1904. "Mercuric cyanide as a disinfectant." Harrington. He found that the tablets of this salt, prepared with borax for use upon surgical instruments, even when used in double the strength recommended, had apparently no effect upon cultures of *staphylococcus aureus* after acting one-half hour.

Practically the same result was obtained when the pure salt was used.

Deutsche Vierteljahrsschrift fur Offentliche Gesundheitspflege. First Part, 1904. This contains a very interesting discussion at a meeting of the German Public Health Association, of water purification by ozone. The method is explained scientifically and defended by Dr. Ohlmüller, and not seriously criticized by others.

Hygienische Rundschau, Vol. 14. No. 5. March 1, 1904. Proskauer and Elsner show by further experiments that water vapor even at 3½-4 atmosphere of pressure, will not surely kill all anthrax spores if they are on hair, but if they are on silk threads they are killed in one-half hour, even at common atmospheric pressure. Thus is again emphasized the importance of a knowledge of conditions in disinfection.

In the same number Herzog gives results confirming practically the previous work of Esmarch that water vapor at 70°-80° containing formaldehyde, will destroy anthrax spores upon hair, leather, etc., without injuring the goods.

Reference is also made to experiments of Abba and Rondelli, showing that while a 5% solution of corrosive sublimate will kill test objects in 3-5 minutes, it will not sterilize walls and partitions when sprinkled on them. To be effective in such places a 10% solution must be used.

The value of warm sodium carbonate solution as a disinfectant is confirmed by Simon. It now seems clear that there is no better disinfectant for very many uses than a 5% solution of this salt, applied at a temperature of 50°-60° C.

Centralblatt fur Bakteriologie, Vol. 34. No. 10. January 20, 1904. "The disinfection of the telephone." Kausch. Gives a description with cuts of several patented devices for disinfecting the mouth-piece of a telephone.

Zeitschrift fur Schulgesundheitspflege, Nos. 2 and 3, 1904. "The disinfection of books." Benda-Berlin. Calls attention to the danger of the spread of infectious disease through library and school books. Cites among other proofs of this the recent report of Dr. Mitulescu to the Royal Institute of Infectious Diseases in which he speaks of finding tubercle bacilli in many books which had been in long use in a public library. He recommends that the danger should be met as far as possible by notices in libraries calling attention to the advisability of handling books with clean hands, of not touching the hands to the mouth after handling books until the hands are washed, and in addition submitting books much used to the action of formaldehyde vapor once in a while.

It is probable that the inside of books is a most suitable place for bacteria to keep their viltality because when the book is closed they are protected from action of light and circulating air. The best practical way to disinfect books is to arrange them so the leaves separate, and submit them to formaldehyde fumes in as small a space as possible. From a public health standpoint water-proof paper and ink to use in making school books are very desirable.

Centralblatt fur Bakteriologie, Vol. 34. No. 14. February 26, 1904. "Apparatus for use of dry heat in disinfection." Kausch. Gives cuts of various patented devices for generating dry hot air for disinfection. They are mainly of historical interest only and no claim is made for their practical advantage to-day.

Hygienische Rundschau, Vol. 14. No. 9. May 1, 1904. "Soaps as disinfectants." Konradi. Confirms previous experiments by others that pure soap has little bactericidal power, but shows also that most toilet soaps have a strong action to destroy bacteria, due entirely to the flavoring materials present, such as turpentine, vanilin, cumarin, heliotropin. Such soaps when dissolved in water 1-1000 killed anthrax spores in 12 hours.

In the same journal in a notice of the work of Heller, which seems to prove that although pure soap has only little action as a bactericide, yet its addition to other disinfectants frequently causes a marked increase in disinfecting power. He thinks this may be due to the formation of a more disinfecting compound, or perhaps to increase of ionization. Konradi's results given above may also have a bearing on the matter.

Centralblatt fur Bakteriologie, Vol. 34. No. 22. May 17, 1904. "Patented formaldehyde generators." Kausch. Gives a list of more than fifty of such patented devices, with cuts of the most important. A valuable article for reference.

Public Health, London, Vol. 16. No. 9. June, 1904. "Experiments on disinfection." Green. Found that exposure for four days to bright sunlight had little or no effect on typhoid and staphylococcus. Also that subtilis on silk threads was not killed by boiling in water for two hours, but was killed by steam in fifteen minutes.

In the same journal Klein gives results of tests of relative action of carbolic acid, formalin, and cyllin on plague bacillus. Five c.c. of the disinfectant was treated in a test tube with 5 drops of an emulsion of the bacillus. He concludes:

That carbolic acid 1-80 and cyllin 1-2400 in water have about the same action, both killing the bacillus in 10 minutes, but that formalin 1-30 is less effective than either. Cyllin is the new name for Jeyes' fluid of creolin.

Centralblatt fur Bakteriologie, Vol. 34. No. 24. June 6, 1904. "New apparatus for disinfection and sterilization." Kausch. In this article Dr. Kausch continues his description of patented devices and disinfectants. Nothing gives one a better idea of the activity in this direction than to examine these patents. But while many of the devices show great ingenuity they are mostly too complicated to be of practical use to the health officer, or too inefficient. An apparatus for protecting toothpicks from becoming infected shows to what details the science of preventive medicine has reached.

Probably the most valuable thing in the article from a scientific standpoint is the description of the way to make the compounds of formaldehyde with terpenes, and menthol and borneol, and the valuable metal soaps. The former are of value in internal antisepsis, and the latter for the preservation of wood and disinfection of animals.

Giornale della Reale Societa Italiana d'Igiene, Vol. 26. No. 10. October 31, 1904. Galli and Ceradini have very lately published the results of their experiments for determining the value of lysoform as a disinfectant, particularly for the hands and instruments, and for other surfical work. They state that lysoform is an alcoholic solution of potash soap, containing from 15 to 20% of formaldehyde. Their conclusions are that the combination of these substances augments the action of the formaldehyde and at the same time renders it less toxic and less irritating. They especially recommend it for its detergent and rapidly penetrating qualities.

Bulletin No. 64, Bureau of Plant Industry, U. S. Department of Agriculture. Moore and Kellerman have made a study of the literature relating to the action of copper sulfate upon bacteria and algae, and have done some experimental work of their own to further elucidate the question. Their method has successfully been used for ridding the reservoirs of public water supplies of troublesome algae, and they deem it probable that the same method can be used for the purpose of sterilizing water supplies infected with pathogenic organisms. Their work has opened a wide field for further work to determine the value and the limitations of this process.

Report State Board of Health. Maine. 1904. "Experiments in formaldehyde disinfection." Evans and Russell. This is a report of work done in the Laboratory of Hygiene by direction of the State Board of Health. Actual tenement house rooms were used, and the formaldehyde liberated from formalin by action of potassium permanganate. The crystals of permanganate were put in the bottom of a common earthen jar or better in a dish made for the purpose of common tinware, about 10 inches in diameter and 17 inches high, the upper 9 inches flaring out at an angle of about 50 degrees. This was placed in the room and the formalin poured upon it. Heat is generated and within 5 minutes 80 percent of the formaldehyde is driven into the room. They used at rate of 1 quart formalin to 1000 cu. ft. They made 279 trials exposing 1529 cultures of diphtheria, anthrax, subtilis, pyogenes albus and aureus, pyocyaneus, tetragenus, streptococci and mixed cultures from throat swabs. They got only 27 growths. They found three hours exposure as effective as a longer time. They got also more penetration than is usual with other methods. No extra water was used, but the atmosphere was quite humid. Twenty-one of the 27 growths were of subtilis. The method is simple and not dangerous, and not so expensive as to be prohibitive.

Room disinfection in Germany. In closing this report we will give a brief account of the methods used in Germany to disinfect rooms. It is taken chiefly from a report of a special visit to various cities made by Petruschky for the purpose of finding out the facts. He visited Halle, Berlin, Dresden, Munich, Breslau, and Posen.

In all cities except Berlin, the general method used was that recommended a few years ago by Flügge of Breslau. It consists of formaldehyde fumigation combined with steam disinfection of beds at disinfecting stations. In case of much filth solutions of formaldehyde are poured upon it.

The formaldehyde is evaporated into the room from a very dilute solution of formalin to prevent polymerization. For 100 cubic meters of space about 1½ liters of 8% formaldehyde solution are evaporated.

The room is first closed and cracks and openings sealed with wadding paper and putty. Everything in the room is arranged so that the gas can get at all surfaces. The room is kept closed for 3½-7 hours and then ammonia sent in to neutralize the formaldehyde. The bed and bedding are then removed to the station and disinfected with steam.

In Berlin formaldehyde disinfection on the same ground plan is used to a certain extent chiefly in the better houses. But in general all articles which will stand it are wiped over with 3% carbolic acid solution, and all beds, bedding, carpets, rugs, curtains, etc., are removed to the station and disinfected by steam. Formaldehyde fumigation may or may not be used also according to circumstances. No sulphur fumigation is used in any of the cities.

Probably the above plan, especially Flügge's, is essentially followed in most American cities, large and small. Certainly it is the plan that this Committee recommends as on the whole the safest and best in accordance with present knowledge on the subject.

There is one important point in room disinfection which is not generally considered even by those with knowledge, and that is that fumigation with a gas like formaldehyde does not cease its good work when the room is again occupied. It is absorbed to a certain extent by most surfaces, especially clothing and paper and varnishes, and so continues to act upon germs already there and such as may come later for some time. It is well established that a weak disinfectant acting for a long time is frequently as effective as a strong one acting a short time. The presence of formaldehyde had been found on the surface of walls for weeks after they have been exposed to it. Hence the failure of substances to be sterilized at once is no proof of lack of action of a disinfectant in a room. In the same line the writer has seen most remarkable results follow the occasional use of weak solutions of formaldehyde on the floors of schoolhouses — solutions so weak that they gave no disagreeable odor. Infectious colds and other chest borne diseases were much lessened among the scholars. We belive that the occasional use of such solutions on floors and surfaces in dwelling houses as well as public buildings would do a great deal toward improving public health.

THE DISINFECTION OF SCHOOL BOOKS.

By Dr. WALTER D. GREENE,
Health Commissioner, Buffalo, N. Y.

Since the bacterial origin of many diseases has been established, and especially during the last fifteen or twenty years, the efforts of sanitarians throughout the world have been directed toward the prevention of such diseases by a rigid enforcement of quarantine regulations.

In the city of Buffalo, N. Y., the placarding of houses for scarlet fever and diphtheria was commenced in 1889, since which time it has been continually practiced. If the disease occurs in the person of a child attending the public schools, the principal of the school is immediately notified, and all other children from the family where the disease exists excluded until recovery or death occurs. If any books from the public schools or libraries are found in the house where the patient resides, they are disinfected or destroyed after the disease has disappeared. No persons from the home where the disease exists are allowed to appear in public places or upon the street or street cars; no milk in bottles allowed to be left at the house; and no laundry taken from the home until all danger from contagion is past.

An expert visits the house and reports the condition of the plumbing and observes the general conditions — whether sanitary or otherwise.

After death or recovery, the house is disinfected by washing the walls with bi-chloride mercury solution, and liberating formaldehyde gas.

The effect of these precautions has been a marked tendency to decrease the number of cases of contagious diseases and especially scarlet fever. From 1881 to 1891 inclusive, the average population was 210,405, and the average number of deaths yearly, from scarlet fever, was 114. During the latter year — 1891 — Buffalo acquired a new charter.

The amount of money appropriated for the use of the health department, under the new charter, was approximately doubled, and great power was given to the board of health and health commissioner, and modern methods for the prevention of disease were adopted.

From 1892 to 1901 inclusive, the average population was 340,308, and the average number of deaths yearly, from scarlet fever for that time was 48. Examination of the public school books early in 1902 revealed the fact that they were filthy to a degree — especially those used by the lower grades. These books are furnished gratis by the city, and consequently there existed a tendency to use them until they were literally in pieces — a period covering several years. It was thought that these filthy books, worn, and handled by so many diminutive individuals, might be, and probably were, a possible source of contagion, and it was decided that they should be disinfected. The books were placed on their edges with covers widely separated upon tables and shelves in tightly sealed rooms. By placing them in the described position, as large a surface of the leaves as possible was brought into contact with the atmosphere; formaldehyde gas was liberated in the room, six ounces of the comparatively fresh commercial formalin being used for every one thousand cubic feet of air space, the vaporization being induced by the use of wood alcohol being burned under the receptacle containing the formalin. Bacteriological examinations were made of the soiled leaves of the books, both before and after the disinfection, and it was found that about eighty-five per cent of all organisms were killed.

For the three years immediately preceding this school-book disinfection, that is 1899, 1900 and 1901, the average number of cases of scarlet fever reported to the health department by the physicians was 875 yearly, while the average yearly deaths for the same time was 36.

For the three years following such disinfection, that is 1902, 1903 and 1904, the average number of cases reported yearly was 528 and the number of deaths yearly for the same time was 18.

One thing was of some interest, and that was that investigation showed that disinfection was not as effective near the floor as it was nearer the ceiling. It might be argued that a greater percentage of the organisms should have been killed to make the experiment of value, but it should be remembered that pathogenic bacteria are much more easily killed than the non-pathogenic with the possible exception of anthrax.

If the common belief is proven to be true that scarlet fever is caused by protozoa and not by an organism of bacterial origin, then we cannot explain why the result of these experiments tends to show that the organism of scarlet fever may live and thrive on the leaves of school books covered by organic matter, and that thorough disinfection will destroy it, while the same series of experiments failed to show any material diminution, in the number of cases of diphtheria, unless it may be that the unknown organism of scarlet fever is more easily killed than the known organism of diphtheria.

If the result of these investigations shall serve to stimulate health boards and health officers to disinfect the school books of their respective municipalities, and above all should they obtain the same results, the object of this paper will have been fully accomplished.

THE DISINFECTION OF PALM LEAF AND OTHER HUTS.

By Dr. N. del RIO, Vera Cruz, Mexico.

From the time of the discovery by Dr. Finlay, that yellow fever is transmitted by the stings of a mosquito called *Stegomyia fasciata,* and the memorable studies which were carried out by the American commision in Havana and afterwards repeated in Vera Cruz and Rio Janeiro, in every way confirming the discovery of the learned Cuban physician, the disinfection against yellow fever necessarily changed all its methods. It is no longer directed to the extermination of germs that might be contained in the clothing used by the patient or contaminated by his excretions. It is only necessary to exterminate the mosquitoes that may have become infected by stinging some yellow fever patient. At first sight, the process appears simplified, but in practice it has been found rather to become complicated.

If it was only necessary to introduce an article of contaminated clothing into the disinfecting stove, in order to feel certain that a longer or shorter exposure to steam under pressure would leave it entirely purified, we cannot always feel that complete certainty that all the mosquitoes existing in a room that has been occupied by a yellow fever patient had been destroyed. These small insects display such a remarkable instinct in escaping from the agents that are employed for their destruction that in many cases they frustrate the precautions adopted by the most careful operator. They are so small and pass through such small apertures that the slightest omission in covering all joints and cracks is sufficient to render entirely useless the most laborious operation. Among many experiments on this point, I will relate some that we have undertaken to make certain of the efficacy of the agents employed in the destruction of these insects.

In a hermetically closed room, without any cracks in the doors or windows, we set ten *Stegomyias* free. We intentionally omitted closing the small keyhole in the lock, which was opened with a pocket key, naturally a very small one. After papering the floor with white paper, so as to better see the mosquitoes that fell, we set fire to a small quantity of sulphur. We covered the keyhole with a glass funnel, that was well secured to the door by a layer of wax along its edges. After the sulphur had been burning for half an hour, we found six dead mosquitoes on the floor, that were easily seen on the white paper. The other four mosquitoes were found flying in the glass funnel, into which they had escaped through the small keyhole.

On another occasion, we put ten mosquitoes of the same species into a box that measured a metre each way, leaving a crack through which only a table knife could pass. We injected sulphurous vapor into the box, and two mosquitoes escaped through the crack, whilst the others died before the half hour. A relation of all these experiments would be interminable; but I desire to mention one which I found very instructive. Some cases of yellow fever were observed in the fortress of Ulua, on which account the patients were at once isolated and a disinfection made of the barrack room they had occupied. Like other old fortresses, Ulua has walls with a thickness of five or six metres and, in order to ventilate the barrack rooms inside, these walls are traversed by openings with a height of one metre and a width of 20 centimetres, that go entirely through the wall and thus constitute what we may call tunnels. These openings, as well as all the joints and cracks in the doors, were always closed by us very carefully with paper, that was put on with paste made of flour and starch before we commenced to burn the sulphur. Of this we burned 20 grams per cubic metre, and left the room closed for five hours, a period that appeared to me sufficient not to leave a single mosquito alive. A few days after, two fresh cases of yellow fever appeared in the same barrack room, which was again disoccupied and very carefully disinfected. Twelve days after, two fresh cases were observed in the very same room, and again I had it disoccupied and proceeded to repeat the disinfection. Whilst occupied in this operation, one of my assistants called my attention to a fact that appeared to him curious. One of the papers which closed the ventilating hole through the wall had been broken, and through this hole we could clearly see the interior of the room, which was entirely full of smoke, whilst the ventilating tunnel was entirely free from all signs of it. The difference in the density of the air and of the sulphurous gas gave me the explanation of this phenomenon, and, as the air was perfectly still on account of everything being well closed, it did not mix in any way with the sulphurous vapors after they had been formed. It is possible that if we had left the place closed for a longer time, it would in the end have produced a mixture of the gas and air; but, as I have already stated, the room was only closed for four or five hours.

The fact that the cases of yellow fever repeated themselves in this room, which in my opinon had been well closed, induced me to believe that the infected mosquitoes which it contained had not been destroyed, but that, as soon as they commenced to feel the noxious effects of the sulphurous gas, they took refuge in this tunnel and so escaped from those effects. In order to prove this, I had some small pans with sulphur placed in that tunnel, and set fire to them there, and kept the room closed for only two hours, not a single fresh case appeared in the fortress, thus confirming my view of the origin of the epidemic.

Having by these cases learned that, in order to make an efficacious disinfection against yellow fever, the only object of which is to destroy the mosquitoes that may have become infected, the first and only indispensable condition is to close every crack or opening, however small it may be, because the combustion of the sulphur is slow and therefore the sulphurous gas which is liberated is correspondingly slow, for which reason it is also slowly diffused through the atmosphere of the room, and on feeling the first effects the mosquitoes, with their admirable instinct of preservation I have already mentioned, look for a means of outlet and, if found, utilize it, with the result that the fumes of the sulphur do not find the mosquitoes which they are intended to destroy and the operation is entirely useless. With this conviction I was commissioned by Dr. Liceaga, President of the Supreme Board of Health, to visit the towns between Tampico and Laredo, in which a very severe epidemic of yellow fever had prevailed during the previous year, for the purpose of overlooking the disinfection of all the houses in which persons had been attacked during the epidemic, notwithstanding that all those houses had been disinfected at that time. Dr. Liceaga desired to be perfectly certain that not a single infected mosquito was left, and that the disease would not reappear during the following summer. Hardly two months had elapsed since the appearance of the last case and the winter had fully set in, for which reason it was supposed that if any of these infected insects had remained hibernating in the interior of the houses they could be easily destroyed with a new disinfection.

I started on my expedition from Tampico, where I found the first huts built of palm-leaf, and in many of which cases of yellow fever had been observed. I at once understood the immense difficulty of covering all the openings in those huts in such a way that I could feel certain that not a single mosquito had remained inside without feeling the effects of the sulphurous vapors. Fortunately, these huts were comparatively few in number and of slight value, so that when I reported to the president of the board that in my opinion it would not be possible to make a disinfection in those huts that would give the guarantee which he desired, he authorized me to burn them all, after duly compensating their owners and at the same time prohibiting their reconstruction with similar material. Having brought my work in Tampico to a close, I passed on to Ciudad Victoria, and there I encountered the real difficulty. Seventy per cent of the houses of that town are built of palm leaves, and therefore it was impossible to apply the extreme remedy that I had applied in Tampico, as the compensation would amount to a very large sum and, moreover, it was necessary to consider how we could dispose of the inhabitants until those houses were replaced with others that did not present those objections. We commenced to make some experiments, and our failures were equal in number to those experiments. We covered the whole of the walls and roofs with manila paper; but the paper would not adapt itself to the purpose, and interstices were left, in which the mosquitoes were subsequently found flying. We put them under a tent similar to the canvas of a circus; but the operation of erecting that tent was both long and costly, and, as it was not possible to make a tent that would fit each house, folds were left in which the mosquitoes took refuge, and all our work was lost. Every day I reported to Dr. Liceaga on the experiments undertaken, and every day I received a new suggestion intended to remedy the defects that had been encountered. It was necessary to find a practical and secure method; practical in the sense of allowing a certain number of disinfections to be made every day, in order that they might all be completed within a brief period and before the summer set in, and secure in the sense that the whole of the mosquitoes could be killed without leaving any point through which they could escape. At last, and after many trials, I remembered the old method of curing ulcers with strips of sticking-plaster, and bands of cloth were stretched from the ground on one side, over the walls and roof, down to the ground on the other side. The second band was laid alongside of the first, and overlapping it, and so on until the entire hut was covered. The joints and corners were held together with strings, so as to avoid the formation of folds in which the mosquitoes might hide, and the whole affair was given the form of a Maltese cross, such as was formerly employed in binding up amputations. From the very first disinfection made by this method I commenced to find on the floors of the houses and in the cloth, when I came to remove it, mosquitoes, beetles and other insects, all dead and proving the efficacy of my operation. I repeated my previous experiment of placing a certain fixed number of mosquitoes in the interior of the house and covering the floor with white paper, and I always found them dead, either on the floor or on the canvas with which I had covered the walls and roof.

This is a practical method, and, with the assistance of six men, I was enabled to make twelve and even fifteen disinfections every day, which were well guaranteed, as I afterwards found the insects dead, thus proving that they had been unable to escape. It is also economical, as with a cotton cloth worth ten cents per metre I made all the bands which served for many disinfections of houses of different sizes, the question reducing itself to the stretching of more or less bands, according to the size of the house. When the house is isolated, the operation is easier than when it joins others as, in the latter case, it is necessary to prolong the series of bands over the adjoining houses; but however it is done, it is equally efficacious.

I made several disinfections by this method in the presence of the commission of the Marine Hospital Service in Laredo, Texas, and had the pleasure of hearing from Dr. Hamilton, chief of that commission, the most encouraging words of approval of this method, which combined three very desirable conditions: facility of execution, certainty in its results and economy in cost.

I present a small model of these huts, and of the bands that were employed to cover them. In presenting this paper to so respectable a corporation, I do not claim to impart a knowledge of any important discovery, but only desire the members to take into consideration for a moment the difficulties that imposed on me the employment of such a method. A population of 10,000 inhabitants had just passed through a most disastrous epidemic of yellow fever, that had only been brought to an end by the winter, and this town consisted mostly of palm-leaf huts. It was necessary to avoid a recrudescence of the epidemic, and all the efforts of the Supreme Board of Health of Mexico were directed to that end. Seventeen months have elapsed since the last case was observed and, in the whole of that time, not another case has appeared. This is the result that has been obtained from the perseverance with which Dr. Liceaga, the distinguished president of this board, has introduced throughout the Mexican republic the methods that were employed in Cuba, in order to stamp out the terrible yellow fever epidemic from its soil. In the work which will be presented to you by my esteemed companion, Dr. Iglesias, you will see the results that were obtained in Vera Cruz, the cradle of yellow fever, from whence it has spread to other parts of the continent. In that place, thanks to the continuous labors of Dr. Liceaga and the progressive policy of the present government of Mexico, the sewerage and water supply works have been carried to a successful termination and the paving of the streets will shortly be commenced. This is the work of Dr. Liceaga in Mexico, and the fact that I am one of his subordinates, but at the same time one of the most enthusiastic admirers of his incessant work, is what has roused my vanity in order to give you a knowledge of his labors, amongst the many that his brilliant professional career can proudly refer to.

REPORT OF COMMITTEE ON THE INFECTIOUS PERIOD OF COMMUNICABLE DISEASES.

By Dr. S. H. DURGIN, Chairman, Boston, Mass.

The chairman of the Committee on the Infectious Period of Communicable Diseases, is unable to find anything in his own experience or in that of other observers to indicate any likelihood that the unsteady periods of incubation, observation and infection of communicable diseases can ever be reduced to uniform time limits.

The period of incubation in each disease varies so much with different persons, that it is impossible to state with any degree of accuracy how many days may elapse after an exposure before the disease will manifest itself, if at all.

The period of observation or time during which the health officer or quarantine physician should hold a person under surveillance after his exposure to infection, can be determined only after settling upon a reasonably long period for incubation. Such period of observation must be arbitrary and unsatisfactory so long as the period of incubation remains uncertain.

The period of infection, though varying in length, is open to more hopefulness. The bacteriologist has led the way and determined the beginning and end of this period for certain diseases by the presence or absence of the virulent germ, and is still vigorously pursuing his work with such frequent successes as to warrant the belief that the hidden causes of many more of the communicable diseases will, in time, be added to the group of those which have been already brought to light.

The writer must content himself with presenting abstracts from some of the prevailing opinions and suggesting conclusions concerning the periods of icubation, observation and infection with a few of the infectious diseases.

ANTHRAX.

Anthrax is an acute, infectious disease, known also under the names "Malignant Pustule," "Splenic Fever," "Charbon," and "Wool Sorters' Disease," is common in animals, particularly sheep and cattle. It may be introduced into the human subject through abrasions of the skin, by inhalation of dust from infected wool, hides and other infected articles. The stage of incubation is usually from 24 to 48 hours, and the pustule develops in about 36 hours.

The bacillus may be found in the pustule and, in septicaemic cases, in the blood, especially towards the fatal termination. I am able to quote by the courtesy of Doctors Duval and Lewis of the Boston City Hospital, a case of anthrax, not yet published, occurring in the summer of 1904, in which the bacilli remained in the blood after recovery and for ten days after the excision of the local lesion. The bacilli were less abundant just before the discharge of the recovered patient than at first. It is not improbable that anthrax bacilli in the blood of recovered human patients occur quite frequently.

The period of infectiousness begins with the development of the pustule and continues until the pustule has healed, in external cases. In the internal form, the infectious period is as long as the bacilli may be found in the blood or in the discharges from the bowels.

BUBONIC PLAGUE.

Kitasato's conclusions, in his report on the Hong Kong epidemic, were that "in the plague, bacilli are found in the blood, glands and viscera, that it gains entrance into the body through the respiratory tract, through excoriations of the surface, and the digestive tract." According to the Austrian Commission, it has also been shown that animals can be infected by cultures being rubbed upon the unshaven skin.

Scheube, (Diseases of Warm Countries, 1903,) says, "The plague bacilli in the first place are found in the buboes which represent the primary seat of disease, and to which, in mild cases, the disease remains restricted. The bacilli have also been found in the bile, urine, sputum, saliva, coating of tongue, and in the skin lesions, (pustules, carbuncles, etc.)"

Plague pneumonia is doubtless to be traced to infection by inhalation.

The gastro-intestinal canal is finally, according to Wilm's investigations, a fourth way by which the bacillus may be received into the body. The transmission takes place through eating infected food, (according to Jansen, by partaking of the flesh of plague-sick pigs,) or drinking infected water.

In regard to the method of transmission, a great deal depends on the form of illness exhibited. Cases belonging to the simple bubonic form play relatively an unimportant part. The bacilli in this form are imprisoned in the buboes. The septicaemic cases, on the other hand, are very important; for in these, during the last stage of the disease, the bacilli are in the blood and may escape thence by way of the numerous internal and external hemorrhages and may be therefore transmitted by means of the vomit, stool, urine, sputum, etc. The pneumonic form, is the most dangerous of all, for the bacilli may be easily disseminated through the expectoration.

The period of incubation is most frequently four to six days, may be as short as two, sometimes as long as ten. The period of observation should be ten days. The period of infection varies with the form of the disease. The patient must be regarded as a possible source of infection so long as the bacilli may be found in the bubo, blood, urine, feces, sputum, saliva or skin lesions.

CHOLERA.

An acute, infectious disease with abrupt onset, ending in death or recovery within a few days. It is dependent upon a specific organism, which was announced by Koch in 1884. This organism invades the body through the gastro-intestinal canal, by infected drinking water or food. The bacillus may be found in the intestines and in the stools. The area of infection is small, and persons merely in contact with patients are rarely affected. Dry air and sunlight soon destroy the virulence of the bacilli, but they may be found in drinking water and may survive in dark, damp places, for a considerable length of time. The immediate disinfection of all stools and soiled linen is of the greatest importance.

The period of incubation is generally from two to four days. It may be one day or as many as eight. The period of observation should be eight days. The infectious period begins with the earliest symptoms and lasts until complete recovery is made, or until the stools are free from the bacilli.

DIPHTHERIA.

Osler gives the period of incubation as from two to seven days, generally two days. Wood and Fitz say it is two days or more.

Williams gives the usual period of incubation of diphtheria of the throat and larynx as two days, and not often exceeding four days.

The Code of Rules for the Prevention of Infectious and Contagious Diseases in Schools, gives 12 days as the period of observation.

Wesbrook had a case lasting 19 months, the bacilli being fully virulent to the end.

The disease may be readily communicated from person to person or by fomites. Bacilli may be transferred from the membranous exudate or discharges from diphtheria patients, from the secretions of the nose and throat of convalescent cases of diphtheria in which the virulent bacilli persist, from the throats of healthy individuals who have acquired the bacilli from being in contact with others having virulent germs on their person or clothing. In such cases the bacilli may sometimes live and develop for days or weeks in the throat without causing any lesion. (Park and Beebe.)

The Klebs-Loeffler bacillus is regarded as the sole criterion of true diphtheria.

The period of incubation is generally two days. It rarely exceeds four days, but occasionally reaches seven.

The period of observation should be seven days. The period of infection is from the onset of the disease and as long as virulent bacilli may be found. Two consecutive negative cultures from the nose and throat should be obtained before releasing the patient.

INFLUENZA.

An acute, highly infectious disease, with catarrh of the mucous membranes, principally the respiratory and gastro-intestinal. The contagion is mostly, if not entirely, communicated directly from the sick to the well.

The period of incubation is generally two or three days. It may be one day or the period may be as long as five days. The period of infection begins with the first manifestations of the disease and continues until all catarrhal symptoms have disappeared.

LEPROSY.

A chronic, infectious disease, which may be communicated from man to man directly or indirectly. Three forms of the disease are recognized: — the tubercular or nodular, the anesthetic or nerve and the mixed. The *Bacilli leprae* are found in all forms of the disease and furnish the positive evidence in diagnosis. Scheube says, "The *Bacilli leprac* are distributed to an extraordinary extent in the body of the leper. The bacilli are found in the tubercles, the infiltration of the skin and mucous membranes, more particularly in the freshly formed spots, and in the lymphatic glands. The secretions from the mucous membrane of the nose play the largest part in the distribution of the bacilli." According to Sticker's investigations, the nose is the part from which leprous patients exude bacilli regularly and mostly in enormous numbers in their own immediate neighborhood. Sticker examined 153 patients of whom 127 or 83 per cent had bacilli in their nasal secretions. Of these, 55 out of 57 patients had tubercular leprosy; 45 out of 68 nerve leprosy, and 27 out of 28 had the mixed form. The bacilli were found either in the purulent secretion of ulcerated, reddened and swollen patches or in the mucous at the exterior part of the septum. The different secretions or excretions of lepers in which the bacilli are found, may become carriers of the virus of the disease. Transmission may be expected by the use in common of utensils for eating and drinking (Hanssen and Looft). Transmission by means of insects such as flies, bugs and mosquitoes, is possible. Scheube says, the mucous membrane, more particularly the nasal mucous membrane, forms a frequent point of entrance for the bacilli. Sticker is even of the opinion that in leprosy as in chronic glanders, the primary effect has always its seat on the mucous membrane of the nose, and that leprosy therefore primarily is a nasal disease. The incubation period may last for years. Bergman, on summing up of communicated observations, has come to the conclusion that the average period of incubation is three to five years. Ipsey believes that incubation in the multiplicity of cases does not exceed two years. Cases with periods of incubation of ten, fifteen and twenty years, or even longer, have been communicated. Hallopeau reports a case in which the period was thirty-two years, but this should be regarded with suspicion. (Scheube.) The duration of the disease in Norway is computed as 18 or 19 years for nerve leprosy and 8 or 10 years for nodular leprosy. (Danielssen and Boech, Bedenkap). In the Baltic provinces, the duration is respectively 18 years and 9 or 10 years (Hellat); in the British colonies 15 to 20 years and 9 to 12 years respectively. Impey gives a shorter average duration, 5 years and 5 months for the nodular form, 11 years and 5 months for the anesthetic form, and 9 years and 3 months for the mixed form, these figures being the result of his experience on Robben Island off Capetown.

The infectious period must be regarded as commencing as early as the diagnosis of the disease can be made clear, by clinical or bacteriological evidence. The presence of the disease is placed beyond a doubt by the demonstration of the leprous bacillus. Karlando advises that the fluid of vesicles be examined in their purulent stage. The period of infectiousness begins with the onset of the disease and ends only with the death, or possible recovery of the patient with absence of all *Bacilli leprae*.

MEASLES.

An acute and extremely infectious disease. Williams says the interval between exposure and the prodromal symptoms is usually ten days, but may be as short as five and perhaps four; on the other hand it may be as long as fourteen days. He also says that owing to the fact that measles is infectious from the outset and that the first case in a household may be readily mistaken for a common cold, an attempt to arrest its spread by adopting preventive methods, especially isolation, is practically futile, hence the difficulty of arresting an outbreak of this disease in a family or community. Hebra successfully inoculated with the nasal mucous and found the symptoms showed themselves in eight days, indicating a much shorter stage of incubation after inoculation. Hochsinger gives 10 days as the period of incubation. Griffiths says the majority of observations agree in fixing the incubation period at 10 to 12 days. Crandall says it may range from 9 to 21 days. Holt (Diseases of Infancy and Childhood, '97) states that of 144 cases where the period of incubation could be definitely traced, in 66 per cent of the cases the incubation between exposure and catarrh was between 11 and 14 days and in only one was it less than a week. Osler, (Principles and Practice of Medicine, '97) gives the incubative period from 7 to 18 days, oftenest 14, and after inoculation less than 10 days. It is communicated principally, if not wholly, by direct contact, and has a large area of infection. The period of incubation is generally 10 or 12 days. It may be as short as eight and is sometimes as long as 14 days. The period of infection is from the beginning of the earliest symptoms to the end of the catarrhal symptoms, and probably desquamation.

MALARIA.

Malaria is communicable in practice only indirectly, through the mosquito, one or two species of the *Anopheles*. It depends upon a parasite which develops in the red blood corpuscles of man and destroys them, and was first discovered by a French military surgeon, Laveran. Theobald Smith says, "The time required for this parasite to pass from the red blood corpuscle into the mosquito and to develop there, until it is ready to pass out again, is about ten days, in favorable hot weather, so that if the mosquito is infected to-day with blood from a patient, in about ten days that mosquito is ready to discharge these little bodies from its salivary glands into man again. The period of incubation in man is about ten days, so that twenty days would elapse between one case of malaria and another, as the shortest possible interval. Of course this interval may be greatly lengthened out by cold weather, for in cold weather the evolution of the parasite is greatly retarded in the insect.

The infectious period in man commences with the development of the disease, and may be extended for many years, or during the remainder of life. This will be as long as the malarial parasite can be found in the blood, including relapses of the disease, and the patient may be infectious even when the parasite is not readily to be found in the blood.

MUMPS.

An acute, infectious disease, dependent, undoubtedly, upon a microorganism. Eustace Smith gives the report of the Clinical Society of London in which the period of incubation was said to vary from 14 to 25 days. When the complaint begins it is infectious from the very first, and can be communicated while the patient is merely ailing, and before any signs of glandular swelling are to be detected. Williams says, "The incubation period in epidemic parotitis is long, the usual period being 21 days, but periods of 19, 18 and 17 days are frequent." The Code of Rules, issued by the Medical Officers of Schools Association, London, recommends that the period of observation should be 24 days. Mumps is very infectious at the earlier stage and during the prodromal symptoms, if they occur. The risk of infection diminishes progressively from the onset of parotitis, and as a rule, has ceased in three weeks from the beginning, probably in most cases in a fortnight. The code of rules directs isolation for four weeks, when the patient may mix with others, if all swelling has subsided.

The period of incubation is usually three weeks. It may be as short as 14 days and possibly as long as 25 days. The period of observation should be 25 days.

The period of infection is from the earliest symptoms until the swelling and tenderness of the parotids and all other glands have subsided.

SCARLET FEVER.

The period of incubation in this disease is very short. Murchison's conclusions are as follows: —

1st. The duration of the incubation stage may be only a few hours.

2d. Probably in a large proportion of cases it does not exceed 48 hours.

3d. It rarely exists seven days.

4th. Consequently a person who has been exposed to scarlet fever and does not sicken after a week's quarantine, may be pronounced safe.

Caiger says, "In a large proportion of cases, either two, three or four days. In some well authenticated cases it has been less. On the other hand, it is sometimes as long as five days, and in rare instances even six.

"If the first case in a family was properly isolated, and the necessary measures for disinfection scrupulously carried out, the safety of the other members is practically assured, if no second case has arisen at the end of a week."

Unger says, "The period of incubation may be less than 24 hours, where it enters the body through a wound. In other cases it is 2 to 4 days or 4 to 7 days, but seldom more."

In 84 per cent of cases Holt found the period to be less than six days and in 66 per cent between two and four days.

Williams says, "Scarlet fever usually comes on during the second or third day after exposure."

Reimer believed that in more than two-thirds of the 3,624 cases which he collected, the disease came on within the first three days after exposure.

The Code of Rules recommends that the period of observation be 14 days.

Scarlet fever is infectious from the appearance of the earliest symptoms, and until desquamation has ceased, and all signs of inflammation of the mucous membrane shall have passed away. Infection may be conveyed by the suppurative discharge of the middle ear disease, until a late period. The urine, in consecutive albuminuria, is also said to be infectious, and the patient should receive a series of baths and should not be liberated unless "desquamation has completely ceased, and there be no appearance of sore throat."

The period of incubation is generally two or three days. It is rarely if ever, longer than a week.

The period of observation should be seven days.

The infectious period should be regarded as beginning with the prodromal symptoms and continuing at least to the end of the primary desquamation and until all inflammation of and discharge from the mucous membranes of the nose and throat, due to the disease, have disappeared.

SMALLPOX.

Moore says of the incubation period, its average is 12 days, except in cases of inoculation, when it is only 8 days, or still shorter, 48 hours, according to Curschmann. Welch gives it as from 10 to 12 days. MacCombie says it varies between extremes or five days and 20 or more. Usually it is 12 days, but not infrequently 10, 11, 13 or sometimes 9. Hebra gives the stage of inoculation as between 10 and 14 days, seldom under that time. Williams says, "The initial symptoms are, in a large majority of cases, on the 11th or 12th day, and the eruption appears on the 14th day. An interval of ten days only between the exposure and the initial symptoms is not very uncommon, and then the eruption appears on the 13th day." An interval of only eight days is rare, but Eichhorst has recorded three cases, one in a physician and two in medical students, in which the initial symptoms commenced in two of the individuals in nine days and eight hours after exposure, and in the other nine days and four hours. So short an interval is rare, but when the disease is conveyed by inoculation, the initial symptoms appear on the 8th or 9th or occasionally on the 7th day. It is said the short periods are observed more often in the hot countries than in temperate climes. There is some evidence that the incubation period of hemorrhagic smallpox is shorter than that of the discrete form of the disease. Immerman says, "The period of incubation is generally 10 to 13 days in variola, very rarely more than fifteen days, more frequently less, five to ten days, especially in the very severe primarily hemorrhagic cases." Observation and report of the Clinical Society of London gives 15 days as the period of observation. The Code of Rules gives 18 days. Williams says it will be safer to put the period of observation at three weeks.

The period of incubation is generally 11 or 12 days. It is rarely as short as eight or as long as fifteen. The period of observation should be 15 days.

The period of infection is undoubtedly from the onset of symptoms until all the scabs have become detached and until desquamation has ceased. Infection has been suspected by suppurating discharges left as a sequel to the disease, but in a large experience the writer has never seen any infection follow such a condition. The area of infection is probably larger than in any other infectious disease and probably exists in the secretions and excretions and in the exhalation from the lungs and skin.

WHOOPING COUGH.

Griffith, in the American System of Medicine, says, "Statistics are at variance regarding the length of the period of incubation; that it probably lasts from two to seven days, with an average of three or four days.

Eustace Smith says, "The infectiousness begins with the earliest symptoms, indeed it is in the early nonspasmodic stage that the child is most likely to be a danger to others, for when the whoop appears, his power of communicating the disease begins to decline. Still, it is not at an end until a period of at least six weeks has elapsed from the beginning of the attack.

Williams says, "The usual period between exposure and beginning of catarrhal symptoms is seven to ten days. The characteristic whoop appears seven days later, as a rule, so that the interval between exposure and whooping is usually about 14 days."

Sticker says, "A period of incubation, varying from two to five or eight days in length, without symptoms, precedes the actual disease.

The Code of Rules recommends the period of observation to be twenty-one days, but probably fifteen days would be sufficient, if the individual were examined carefully at the expiration of that period, and found to be free of all trace of catarrh of the fauces and pharynx and all signs of bronchitis. The infectiousness is marked in the earlier stage, but before the characteristic whoop begins. It declines rapidly after the acute stage is passed.

Weill on various occasions permitted nearly 100 young children who had not previously suffered from whooping cough, to be associated in the same ward for 20 days or more, with children suffering from the disease, during the state of whooping. In only one case was the disease contracted, and in this instance the patient from whom the infection was derived, was in the very earliest period of the whooping stage. In three small epidemics he was able to satisfy himself that infection was contracted from children who had not yet begun to whoop. Weill concludes that infection ceases very soon after the characteristic whoop commences, and that therefore in a family it is not the patient who is already whooping, but his brothers and sisters who have not begun to whoop, that should be isolated.

Sticker says that although the greatest risk of contagion is during the catarrhal stage, and although the patient at the height of the convulsive stage is seldom dangerous, it may be taken as a rule that the person is to be avoided as long as he coughs.

The Code of Rules says, "The patient should be kept isolated from susceptible persons for six weeks from the commencement of the whooping and should then be allowed to mingle with others only if the whooping and all characteristic spasmodic cough have ceased. If the cough has completely passed away earlier, which is not often the case, then the rule may be relaxed and the period of isolation shortened.

The period of infection undoubtedly begins with the earliest symptoms of the disease or even before the characteristic spasmodic whooping and ends with the cessation of the spasmodic cough.

TYPHOID FEVER.

Murchison says the period of incubation is most commonly above two weeks, is often less than two weeks, and may not exceed one or two days. Leibermeister says the average incubation period is three weeks. Prof. Quinck says in a series of accurately observed cases, the shortest period was eight days and the longest certain period between 16 and 18 days. Wilson says this period is variable. In general it may be set down as from two to three weeks. In some well authenticated cases, it has not exceeded 4 or 5 days. He mentions one case of only four days' incubation. The Clinical Society of London in a report upon outbreaks down to 1890 confirmed the opinions of the best authors, concluding that the interval between exposure to infection and the development of distinct symptoms is probably most often 12 to 14 days. It is not very infrequently 9 or 10 days, occasionally eight and possibly less. In rare cases, it is prolonged to 15, 18 and even 23 days. Brannan says the usual period is from eight to fourteen days, in rare instances one or two days, and still more rarely, it may be three or even four weeks. Both Ballard and Power, in the report of the committee appointed by the Clinical Society of London, '92, give facts to indicate that the larger doses of the infection are attended with shorter periods of incubation. Dr. Brough investigated an outbreak in Boston in 1904, in which 34 out of 100 or more persons who were simultaneously exposed were seized with typhoid fever. Of these, two were taken ill four days after exposure, seven on the fifth day, five on the sixth day, nine on the seventh day, three on the eighth day, one on the ninth day, two on the eleventh day and five between the twelfth and twentieth day after the exposure. Twenty-six, or more than two-thirds of the whole number were taken ill between the 4th and 8th day after the exposure.

Richardson found typhoid bacilli in the urine of a number of cases of typhoid, and says they are apt to appear in the later stages of the disease and also existed, in a great number of cases, far into convalescence.

The period of incubation is most frequently twelve to fourteen days. It may be as short as three or prolonged to twenty or even more days.

The period of observation should be twenty days from last known exposure. The period of infection begins probably with the earliest symptoms and continues at least into the second week of convalescence or so long as the bacilli may be found in the feces or urine. The feces and urine should be disinfected for a month after convalescence has begun.

YELLOW FEVER.

The period of incubation is three or four days. It may be as short as two and is sometimes as long as five.

Investigation by Dr. Walter Reed shows that the period during which the infection is active and during which the mosquito (*Stegomyia fasciata*) may take up the infective principle, lasts only for the first three days of the disease. This is to be regarded as the infectious period of the disease in man. It then requires 12 days for the mosquito to become capable of transmitting the disease, after which he can convey the disease during his life time. The period of observation should be five days.

It is to be understood that in all cases (except yellow fever and malaria), the termination of the period of infection is to be attended by complete disinfection of patient, and of all infective material.

It is recommended that all infective material be disinfected daily throughout the whole course of the disease; that long periods of enforced isolation (in confined quarters), be deplored, and mitigated whenever consistent with due care for the public health; and that arbitrary time periods for isolation be abandoned whenever the end of the convalescent's power to impart the disease to others can be determined by other reasonable means.

THE SOURCES OF INFECTION.

By Dr. CHARLES V. CHAPIN,
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What is the distribution of pathogenic organisms? The answer is as yet partial and imperfect, but the question is a vital one to health officers. Thus far too little attention has been given to its solution, and too little account has been taken of the knowledge we do possess. With the exception of the period of the dominance of the filth theory, the infectious diseases have for ages been deemed contagious. The contagion was in the body of the sick, hence public sanitation has been based on the isolation of the sick. Until twenty-five years ago we knew nothing about the nature of infection; today we know little about its distribution, and less about its mode of transmission. How can we expect to attain any great success unless we have definite knowledge, and act upon it. It is of the utmost practical importance that we know how widely the pathogenic organisms are distributed. To succeed with isolation we must be able to control most if not all of the foci of infection. The degree of success varies inversely as to the number of unrecognized or uncontrollable sources of infection. One fact, and it is this to which your attention is particularly called, has been becoming more and more evident during the past few years, and that is that the virus of many of our common diseases is much more widely distributed than was formerly supposed.

In the first place it has become recognized that the mild, atypical and neglected cases of the contagious diseases, are very numerous, perhaps more numerous than the well defined cases which come under observation. Cases of mild sore throat which attend school, or go about their work, are more common than are the cases of diphtheria sick enough to send for a physician. Scarlet fever with a slight fever for a day, a fleeting rash of a few hours' duration, and a little sore throat, are seen in every outbreak, and doubtless occur many times oftener when they are not seen. "Walking cases" of typhoid are being discovered in greater numbers each year. Wherever the best diagnostic methods are followed there the number of cases apparently increase and the fatality apparently decreases. The investigation into the cause of this disease among the United States troops during the Spanish war, rendered it almost certain that the unrecognized cases were nearly double the number of the recognized cases. The pathologists tell us that healed tuberculosis lesions are found in a large proportion of autopsies of persons who were never suspected of having tuberculosis. Cases of yellow fever so mild as to escape notice are not uncommon. Bubonic plague also in many instances produces only a few slight symptoms easily overlooked.

We have few numerical data to show how numerous these unrecognized cases of contagious diseases are, but the typhoid investigations of the Spanish war, already referred to, suggest that in that disease they may be twice as numerous as the known cases. As regards diphtheria, some interesting facts may be found in the reports of the board of health of Hartford. In that city during the years 1900-1903 the school inspectors took cultures from the mild sore throats seen in the schools. Of the 2038 cultures taken, 591 or 29 percent were positive. Of course no one believes that all the infected throats were found by the inspectors, and of course there were many mild cases of diphtheria in others than school children. During the same period there were reported in the usual way in Hartford 1537 cases of diphtheria, and it is certainly not unfair to assume that the cases unseen or unrecognized by physicians were fully as numerous.

Secondly it has been equally well established — though it is so unpalatable a truth as to receive scant favor — that well persons are frequently infected with virulent pathogenic organisms. Owing to the immunity of the individual, or to the fact that the organisms are growing in the secretions or on mucous surfaces without being able to penetrate the tissues, it happens that this cultivation of disease germs is frequently going on in persons who are perfectly well. That such persons are a menace to others, and indeed often to themselves, there is every theoretical reason for believing. Moreover it is in accord with practical experience, for numerous cases are on record where the infection in various diseases has been traced to well persons. There is no well defined line between sickness and health so far as infection is concerned. Starting with a malignant and rapidly fatal case of diphtheria or typhoid fever, we have every gradation of severity until the symptoms become so mild as to be scarcely recognized, and finally are entirely absent. The degree of danger to others may depend partly on the severity of the disease but more upon the number of pathogenic organisms thrown off and upon their virulence. But we know that even in persons perfectly well the discharge of disease germs may be as great or even greater than in cases of the most malignant type, and as for virulence we know that the germs growing in the mildest cases may possess a very high degree of virulence, as witness the diphtheria bacillus isolated by Park from a mild sore throat and now universally employed by antitoxin makers because of its high toxin producing power. It is to the distribution of the organism of this disease that the writer has given the most attention. It seems to be the fact, as was to be expected, that the more closely well persons are associated with diphtheria the more likely they are to be infected. The association of persons in institutions, particularly of young children, has frequently resulted in the infection of nearly all the inmates, and this infection has sometimes continued for months and even years. There are very few facts available as to the degree of infection of the well persons in a diphtheria family. The most extensive are those from Providence. Of 2504 adults in the family 11.4 percent were infected. Of 310 children between 5 and 15 years of age — the school age — 19 percent were infected. When it is remembered that most of the examinations were made at the time the case was reported, or for purposes of release, and that in most cases only a single throat culture was taken, it is only reasonable to assume that in the family 50 percent of the children and 25 percent of the adults are infected without becoming sick. As regards the presence of diphtheria bacilli among that portion of the general public, who have not so far as known been recently exposed to diphtheria, the investigations of the Massachusetts Association of Boards of Health are fairly conclusive. Of 4250 persons examined 2.89 percent showed typical diphtheria bacilli. The percentage varied from 6.93 percent in Minnesota, where diphtheria was exceptionally prevalent, to .43 percent in Providence where most of the examinations were made in schools where there had been no diphtheria for months or years. There can be no question that in our large northern cities the number of well persons infected with virulent diphtheria bacilli is many times greater than the number of recognized cases of the disease. The latter are isolated, the former are not. Which are likely to do most to spread the disease?

But it is not only with diphtheria that well persons are infected. Numerous observations have shown that the bacilli of typhoid are found not only in the sick but that they often persist for a long time in the feces and urine of convalescents. So we find that we are trying to restrict the disease by disinfecting the stools while the patient is safely in bed but doing nothing when he is well enough to be about and is spreading the germs broadcast over the land. Recent studies in Germany have shown that not only are convalescents infected but that the bacilli are frequently found in the excreta of members of the infected family who remain perfectly well. This is particularly true of children. If we succeeded in perfectly disinfecting the excreta of the patients who are in bed — which by the way is very often not accomplished — we should be applying this restrictive measure to only a small proportion, and that the least dangerous of the foci of infection. It was believed that the typhoid in the United States army in the Spanish war had its origin in infected well persons who were doubtless to be found in every regiment. What has been said of typhoid applies equally as well to cholera for the spirillum of this disease too, is found in convalescents and in well persons.

It is well known that the influenza bacillus is very widely distributed in human beings. It is found persisting for months and years in chronic cases, and in Boston, even in a year when the disease was not epidemic, it was found in 60 percent of all catarrhal cases examined. Doubtless it is found in large numbers of well persons, though data on this point are wanting. We know also that the pneumococcus is very widely distributed among well persons. In quite another type of disease, we know from definite observations, that well persons are the principal source of its extension. In tropical regions the native children are usually found to be severely infected with the parasite of malaria, yet without showing any symptoms, and it is from them that the *Anopheles* carry it to unacclimated foreigners.

We have no bacteriological evidence as to the distribution of the virus of scarlet fever, measles, and smallpox in well persons, but there are some clinical reasons for thinking that the virus of scarlet fever may develop in persons perfectly well. This may also be true of smallpox though it is probable that well persons are less often infected, if they are infected at all, than they are in most other diseases.

Thirdly there is the question of the infection of other animals than man. In the case of malaria and yellow fever we know that mosquitoes are infected and this fact has been of the utmost value to us. In plague, rats and fleas are infected, though their exact relation to the disease in man is not as clear as we could wish. Yet this knowledge too has been most useful. As regards the other common contagious diseases we know almost nothing about their distribution among animals.

Fourthly there is the question of the growth of pathogenic organisms outside of the animal body. Here again our knowledge is very scanty. We know that many disease germs will under favorable conditions, *live* for sometime outside the body, though exaggerated notions about this are quite generally entertained. We have little evidence as to their reproduction outside of the body, and the indications are that for most diseases this rarely occurs.

Lastly there is another question which is of *great* importance, and that is the question of the permanency of type or species among bacteria. Are the different members of colon group for instance, of the diphtheria group, or the dysentery group, capable of changing from one type to another? Can the Hoffman bacillus become a Klebs-Loeffler bacillus and the colon change to a para-typhoid? And we need more than an academic answer to this question. If it can be shown that such changes *can* be produced we must ask further, how often *do* they take place in nature, and under what conditions.

To summarize it may be said that in regard to all these matters, but particularly in regard to the distribution of pathogenic organisms in animals, their reproduction outside of animal bodies, and their permanency of type, our knowledge is deplorably scanty, and we are impatiently looking to our laboratory workers and the general biologists for answers to our questions. But in regard to mild and atypical forms of disease, and in regard to the prevalence of infection among well persons, we have sufficient data to give cause for serious reflection. We can certainly affirm that mild, unreported, unrecognized and unrecognizable cases of contagious disease are very numerous, and that infected well persons are more numerous still, and that together they far outnumber the reported cases, and constitute by all odds the most important foci for the extension of disease. It seems a hopeless task to try to teach these truths to the laity, and almost as hopeless to teach them to physicians, for unpalatable truths are difficult to teach. And who would even try to convince a court of the danger of infection from people who had never been sick, and yet all official restriction must in the last resort receive judicial sanction. That infection must be closely limited by sickness is an error which even many of the most recent text-books, and many of our most advanced medical schools, have done little to correct.

If it is true that infection is so widely distributed, so much more widely distributed than we formerly supposed, is it not possible that it will be necessary for us to revise our methods of combatting it? In considering this subject it must be remembered, first of all, that we are not dealing with a moral question; no principle is involved; diphtheria and scarlet fever are not crimes to be punished. The measures that are taken must be justified in the results attained. It is a hardship and expense to remove people forcibly to the hospital, to shut them up in their houses, to disinfect, to keep children from school, and wage-earners from their work. Such methods should not be adopted unless there is reasonable ground for expecting results commensurate with the outlay, and should be abandoned or modified if these results are not forthcoming.

It is to isolation and disinfection that your attention is here particularly directed. Have we as yet attained a proper conception of the scope and value of these procedures? It is perfectly plain that if we could isolate every case of a given contagious disease until all infection had disappeared, the disease would not merely decrease, it would be exterminated. If we can only control one-half, one-quarter or one-tenth of the foci of infection, it is equally clear that the disease will never be exterminated, and it is not even certain that it will diminish. The relation of probable success to the efforts made must decide the extent of those efforts. It is the writers opinion that for most diseases, and for most localities, these restrictive measures are either carried too far or are not carried far enough.

Perhaps the problem can be best understood by considering it in relation to diphtheria, a disease which we know more about than we do about any other of the common diseases which health officers have to deal with in the north temperate zones of Europe and America. If a single case of this disease should be reported in a community where there had been none for a long time, the duty of the health authorities would be clear. It would be advisable to isolate the patient, and examine all contacts, or persons who had been exposed, and to isolate them if necessary, to search diligently for hidden or neglected cases of sore throat, and examine all such by repeated cultures from throat and nose. All persons harboring diphtheria bacilli should be then isolated until throat and nose cultures, taken on several successive days, prove negative. Directions for the management of the sick room, such as are usually given in the orthodox circular but rarely followed, should be carried out, and after release from isolation probably some disinfection would be desirable. Such strictness is rarely attempted and, when it is, is not always successful. It may not be unsuccessful because the persons involved rebel before success is attained, or because notwithstanding the strictness some focus of infection remains unknown. Nevertheless, under the conditions named, the most energetic measures should be taken to stamp out the disease, and in very many, probably in most instances, they would be crowned with success.

Almost all cities of from, say 20,000 inhabitants upward, and many with a much smaller population, present far different conditions. In such communities diphtheria has been endemic or epidemic, as one may choose to call it, for years. There are always a certain number of reported cases, and probably the number of unreported or unrecognized cases of a mild type is equal or even greater, and the number of well persons infected with virulent bacilli is greater still. He would be rash indeed who would attempt to apply the methods before indicated. It would almost certainly be found impossible to carry them out. The people would not submit, the co-operation of the medical profession would be lost, and in the last resort the work would be stopped by the courts. To isolate in a large city, all or even half the people infected with diphtheria, is impossible. But without isolating all, or at least all but an extremely small percentage, it is impossible to stamp out the disease. It never has been stamped out in any city of considerable size. What then can be hoped for from restrictive measures? It may be hoped that in such cities they will restrict, even if they do not exterminate. The writer firmly believes that restrictive measures, as practiced in our cities during the last twenty years, have greatly diminished the amount of this and similar diseases. It is possible also that they have modified the type, lessening its severity. But during this period of diminishing prevalence our restrictive measures have been steadily increasing in severity. The writer believes that all the advantages gained could be retained even though much milder methods should be employed. To placard a house keeps people out, and teaches the contagious nature of the disease; removal to a hospital, of those who care to go, certainly prevents many cases; keeping children from the infected family out of school does some good. But to maintain isolation until there is no possibility of infection, to exclude all wage-earners from their work, to shut the entire family in the house, to make hospital treatment universal, to spend large sums for disinfection, although ideals for which many health officers are striving, would seem to be unnecessary and illogical. It is not intended that these suggestions are final, but only that the simpler and less burdensome restrictions are desirable, and that, under the conditions mentioned, stringent measures are not justified for the control of this disease. Why should a man, who has recovered from diphtheria, be confined in his house for weeks and perhaps months, because he has virulent diphtheria bacilli in his throat when it is certain that there are hundreds of others in his city with like bacilli who have never been confined at all. He is sure to ask this question with much irritation; it is asked here in all seriousness. Will the treatment of 90 per cent. of all cases in the hospital avail more than placarding and the removal of the poor only. The history of English cities indicates that it will not, and hospital treatment costs large sums of money. Is it necessary or useful to keep wage-earners from their work, except in certain lines of occupation, when there are so many unrecognized foci of infection? Shall the physician be required, as has been proposed, to frighten his little patients with rubber coat and boots and a mask, when so many people and perhaps even the doctor, are carrying the germs about in their throats? In a large city what proportion of cases contract the disease from infected rooms or their contents, as compared with the number that contract it more directly from well persons or diphtheritic sore throats? Certainly it is a very small fraction. Yet the writer could name a city where $4,000 was spent for disinfection and $1,000 for a medical inspector, and another which boasted of the efficiency of its disinfection, but was the last of the large cities to employ a bacteriologist. Might it not be wise perhaps to cut down this expense a little and employ some one to examine into the necessity for and the value of disinfection? In all our large cities a moderate amount of restriction, for a moderate length of time, will accomplish just as much as more stringent measures. To determine specifically what is best in each procedure is indeed a difficult task.

The epidemiology of scarlet fever appears to be very similar to that of diphtheria, and it requires about the same degree of restriction. Measles and whooping-cough are still more difficult to deal with, because most of the harm is done before there is a possibility of any control. In pneumonia and influenza, owing to the wide distribution of the specific organisms, isolation can accomplish little, and official control in the present state of our knowledge practically nothing. Probably there is more logical reason for isolation in consumption than in any of the diseases mentioned, because the early and unrecognized cases do not discharge as many bacilli as the more advanced cases, but such isolation is not attempted simply because it is hopeless. We content ourselves with teaching the patients to care for their secretions. Perhaps that is our best hope in the other diseases mentioned.

No attempt is here made to decide upon just what measures are best suited for the control of different disease, for this would be to set forth the whole art of sanitation, but by the foregoing illustrations to call attention to the illogical and unwise character of many common procedures. What is especially insisted on is that the virus of many diseases is much more widely distributed than was formerly supposed. This is a discouraging fact, but one that must be reckoned with. It is also insisted on, and this is the crucial point of the whole matter, that a disease with widely distributed and uncontrollable foci of infection does not call for stringent measures of isolation and disinfection.

DIPHTHERIA INFECTION IN MINNESOTA.—RECENT EXPERIENCES WITH THE DISEASE IN SCHOOL CHILDREN AND IN INSTITUTIONAL EPIDEMICS.

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It is not the purpose of this communication to enter into the minute consideration of all phases of the prevention and eradication of diphtheria but to present briefly the general features of some of the methods which have been found practicable in Minnesota and in which the laboratory has been used as the guide to executive action and restrictive measures.

In the work of the Minnesota State Board of Health, the problems have naturally arranged themselves into three main groups.

I. The routine work of dealing with diphtheria as it occurs in family life.

II. Widespread epidemics in which the day schools have to be closed.

III. Infection gains entrance into institutions in which children or other inmates are housed, employed, taught or confined, and where great opportunity for the spread of infection is present.

I. DIPHTHERIA IN FAMILY LIFE.

The routine work of the State Board of Health is probably but little different in Minnesota from that in other parts of America except that it is confined largely to country towns, villages, small cities and rural communities. In general, isolation of suspicious cases is followed by the imposition of official quarantine based on a positive report mailed or telegraphed from the laboratory of the Board to the attending physician and the local health officer. Quarantine is maintained until a negative report, or when practicable, two successive negatives are made on throat cultures.

Modified Löffler's serum made by a rapid process is employed for the culture medium. This contains 1.25 per cent of glycerin, the tubes are covered with rubber caps and the medium remains fit for use for twelve to eighteen months. And Löffler's methylene blue is used for staining. Unless positive, no report is given on fresh preparation or in fact on anything other than a satisfactory culture made at the bedside, forwarded by the local physician and incubated in the laboratory for eighteen hours. In villages and towns as also in smaller cities, no difficulties are presented and the use of the laboratory is becoming more widespread. In country districts where it is necessary for physicians to make long journeys in order to see their patients or where there are not physicians available, it is sometimes impractical to insist on a rigid adherence to the methods outlined for general use. Physicians are urged and the public is educated to take advantage of the laboratory diagnosis as a means of shortening the quarantine period and minimizing the dangers of infection.

Observations covering the years 1901 and 1902 have shown that in clinical cases of this disease, diphtheria bacilli have disappeared in 3 per cent by the seventh day; 27 per cent by the fourteenth day; 51 per cent by the twenty-first day; 83 per cent by the twenty-eighth day; 93 per cent by the 35th day and 100 per cent by the seventieth day.

There is an occasional long persistence of the virulent types of *B. diphtheriae*. One has been under observation within the last few weeks. A school girl, aged 10 years, under the care of her father, one of Minnesota's best physicians and health officers, was found to harbor diphtheria bacilli for 109 days. On the 72d day the bacilli were isolated in purity, tested and found fully virulent. A school teacher, a young woman, aged 20, who had clinical diphtheria still shows that typical diphtheria bacilli which have been demonstrated by thirteen successive positive examinations have persisted for 71 days..

A boy, aged 5, still had diphtheria bacilli present (January 2, 1905), i. e. 79 days since the disease began. On the 46th day the bacilli isolated in purity were virulent for guinea-pigs. Notwithstanding these occasional instances of long persistence, it is plain to all who have studied the question that the laboratory report on the presence or absence of the diphtheria bacillus affords the only satisfactory quarantine.

In Minnesota, when laboratory examination is impracticable, an optional time limit of four weeks from the date of the disappearance of last symptoms is permitted but not encouraged. The laboratory examination will in most cases very greatly shorten this time and since it is the presence or absence of the diphtheria bacillus which constitutes the danger or freedom from danger, the laboratory examination is the only basis of quarantine which should be permitted. All members of

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[1] Since the paper was presented, a pure culture of diphtheria bacilli has been isolated from this patient on the 80th day and has proved fully virulent for guinea-pigs.

a household in which diphtheria is present should be examined should be maintained upon those who show the presence of typical diphtheria bacilli. The fact that similar bacilli have shown themselves to be virulent for human beings by the production of symptoms in a member of the family may be taken as evidence that any of the bacilli which are present in that particular household may be virulent.

II. INFECTION DEMANDING ACTION ON THE PART OF THE SCHOOL AUTHORITIES.

When diphtheria becomes widely distributed in a community necessitating the closing of the day schools or when the disease has persisted throughout the summer months, appeal is often made to the Minnesota State Board of Health for aid in determining a safe course which will enable the authorities to keep the schools open without endangering the health of the public.

Within the last five years, this problem has frequently presented itself and by degrees a simple system has been worked out which has been evolved to yield most satisfactory results. It requires harmony between the local board of health and the school authorities if without the constant supervision of some member of the executive or laboratory staff of the State Board of Health, the local authorities are to be depended on to carry out the necessary details.

In one very recent investigation a most efficient medical health officer happened also to be chairman of the local school board and except for ten days time given to the inauguration of the work and the illustration of methods of tracing infection and some slight technical instruction the work has been carried out entirely by the local authorities. The actual bacteriologic examination and report are made of course, by the laboratory staff of the State Board of Health.

The only remaining factors necessary to successful work are the requisite executive authority, the confidence of the public and a fully equipped laboratory with a staff capable of meeting satisfactorily such emergencies. In this school and institutional work the demand on the laboratory is at times rather heavy. As an illustration in 1897 and 1898, one member of the staff of the Minnesota State Board of Health made and examined in three months over 5,000 cultures in the branch laboratory established for the purpose, and supervised the necessary work of isolation, disinfection and recording.

In the last month (December 1904) in addition to other heavy routine work and considerable traveling it has been necessary for the laboratory staff to examine, record, and report on over 3,500 diphtheria specimens or nearly 9,300 for four months ending January

1st, 1905. The necessity for a smoothly working system is thus made apparent since the school openings all occur at the same time and several investigations may be in progress at one time each one involving the examination and supervision of from 100 to 450 children. The work may perhaps best be illustrated by quoting directly from one or two of a large number of such investigations.

During the year 1900, Park Rapids, a town of about 1,000 inhabitants situated in a lumbering community 350 miles from the laboratory, became badly infected with diphtheria. Not only the school children but adults were also attacked. The neighboring lumber camps and tributary territory became involved and the disease presisted throughout the winter and did not disappear even in the late summer months, owing to repeated re-infection from outside sources. In August, 1901, on the appeal of the locality, the executive officer of the State Board of Health and the director of its laboratory, visited the town to investigate conditions and outline methods for the control of the disease which would interfere as little as possible, with the routine of affairs and which might still permit the opening of the schools to which the citizens had looked forward with dread.

A careful study was made and all cases of diphtheria then in existence were investigated and all rumors and suspicions of possible cases were followed up. At a joint meeting of the town council and school board matters were thoroughly discussed and it was recommended

1. That the opening of school be deferred.

2. That the teacher and children of each room in the school be called together at the school at a specified time on a particular day to be set for each room and publicly announced.

3. That a representative of the State Board of Health be present who would take nose and throat cultures of each one of the children. The cultures were to be forwarded to the laboratory for examination and report.

4. That each child and each teacher who showed diphtheria bacilli be excluded from school until he and *all* of his family were found free of infection.

Dr. E. H. Beckman, of the laboratory, went to the town and spent nearly two weeks in this work of taking cultures and investigating the environments and history of all families in which positive laboratory findings were reported and in recording data including maps, showing location, distribution and dates of infection. As a result over 350 school children were examined, more than 1200 examinations made, school opened one week late and diphtheria disappeared under the conditions and at the time of year when there was every reason to expect its increase. The willing cooperation of the town council, school board and general public was easily secured and retained. The educational value of the work has been as apparent during the subsequent years as was the resulting practical utility at that time.

Since then this work has grown steadily in amount and practicability. Dr. L. B. Wilson undertook and carried forward a similar investigation on approximately the same scale at Grand Rapids, a lumbering center in September, 1903. Owing to the occurrence of the disease in adults such as prostitutes and in employes in saloons, there were certain other practical difficulties to be met and overcome but strict quarantine and restrictive measures were easily formulated and enforced and the results attained were as successful as those in Park Rapids.

Work of a similar character but on a much larger scale has just been brought to a conclusion in Benson, a town of about 1600 inhabitants in a farming community where diphtheria had persisted throughout the summer of 1904. The health officer, Dr. Scofield, is also chairman of the school board. The town council and school board stood ready to second his efforts in every direction. Dr. L. B. Wilson of the laboratory, went to Benson, September 6th, 1904, in order to make a thorough investigation and examine all of the school children and teachers before the opening of school. A different plan was followed here, namely to go from house to house making careful inquiries and taking specimens of all the inmates. What was really a practical quarantine was instituted wherever individuals were found infected with diphtheria bacilli, independent of clinical manifestations and school was not opened until all the school children and their families had been examined. On the opening of school only children who were themselves free from diphtheria bacilli and whose families were also free were permitted to attend and as a result the disease has disappeared. During Dr. Wilson's visit and after his return to the laboratory at the end of ten days provision was made by the locality for the careful following up of all individuals who had come recently in contact with clinical cases and in this way much interesting and valuable information relative to the spread of diphtheria was secured. In some instances, diphtheria bacilli were found present in exposed individuals several hours or days before the symptoms of the disease appeared.

Similar methods have been employed and comparable results obtained in a number of other places notably Bowerville, Duluth, Robbinsdale, Heron Lake, etc.

In dealing with day school infection it therefore seems to be entirely practical to exclude infected individuals or children of infected households independent of clinical manifestations of the disease since the school authorities are at liberty to exclude pupils perhaps more readily than it is possible to enforce strict household quarantine. In Minnesota public sentiment supports methods and at times demands them.

By the substitution of the comparative segregation of home life for the crowding together of school life the danger of distributing or receiving infection is minimized as the possibility of the control of diphtheria increases with approximation of individual isolation.

III. DIPHTHERIA INFECTION IN INSTITUTIONAL LIFE.

This affords a problem in which the difficulties are in direct relation to facilities afforded for the exchange of nose and throat contents between inmates.

Amongst adult prisoners, especially where isolation is almost complete, there is little danger of the spread of infection. On the other hand in charitable institutions where children are constantly associated in large groups, at play, at school, at work and in dormitory life the chances for the spread of infection are not only greatly increased but additional opportunities for its introduction from outside by new comers have also to be recognized.

During the past nine years the Minnesota State Board of Health has been called upon to take charge of epidemics of diphtheria in a number of state and private institutions in which the variation in conditions of life and environment was very great. These have included the State School for Dependent and Neglected Children (practically a state orphan's home of 250 or more children), State Training School (a correctional home for nearly 500 children), State Hospitals for the Insane (with 1,000 to 2,000 inmates), State Schools for Deaf, Dumb, Blind and Feebleminded, seminaries and schools where the students are housed, Charity orphan asylums and a charity lying-in home where women are admitted and employed in some capacity for a year after their confinement. While each institution presents peculiar features and has individual difficulties which can be properly understood only by the consideration of a detailed report illustrated with maps, photographs, clinical notes and accurate data,[2] certain general features common to all may be mentioned here in relation to the measures for control. In all there is the massing together of individuals either in dormitory life, at meals, for instruction or religious exercises and during employment in the fields or in work shops. This increased opportunity for exchange of the bacterial flora of nose and throat is in direct relationship to the age, intelligence and habits of the individual as also to the character of the institution and structural and other environmental conditions.

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[2] These will appear in the Bi-ennial Reports of the Minn. State Board of Health.

A recent investigation not yet complete may serve as an illustration of methods and results.

The State School for the Deaf at Faribault provides for the housing and instruction of over 280 pupils, mostly children, but above the age of 8. Certain of the pupils are state or county charges, but all of them are returned during the summer vacation either to their own homes or to a home provided for them. Most of the employes and teaching staff, about 50, reside, not in the institution but in the town. Diphtheria appeared on September 25th, 1904, having been prevalent in Faribault for a number of months both in the residents and in the employes of a boarding school for girls. Owing to the increase of infection Dr. Bracken the executive officer of the State Board of Health was called to give advice and aid. On his recommendation a member of the laboratory staff, Dr. McDaniel, went to the school December 2d, 1904, and found 17 clinical cases, three more appearing on the following day. The general arrangements provide dormitories for the girls in which from six to twelve are accommodated in single beds. In a separate building similar accommodations are available for the boys, the building being divided by a wall in the center so as to separate them into two groups according to age. Meals are provided for all pupils in one dining room. A separate new school building is available for their instruction, although some pupils are still taught in the main building. The clinical cases had all been removed to the school hospital, a separate frame building.

Immediately all the employes and teachers were examined by nose and throat cultures for the presence of diphtheria bacilli. All infected individuals were quarantined in their homes or isolated in the institution. All who showed suspicious bacilli (other types than D., C. or A.) were re-examined, and if they failed to show D., C. or A. on the second examination were released.

As it was impracticable to examine nose and throat cultures from all pupils in one day they were grouped according to the possibility of providing isolation in sleeping quarters. These were practically according to age and sex, the smaller children being examined first because they showed greater infection. As examination proceeded the girls shown to be uninfected by double negative of both nose and throat were housed and fed in the detached and freshly sterilized school building under the supervision of uninfected teachers. Similar arrangements were made for the boys in the manual training building. The children showing suspicious bacilli were kept in their quarters until two re-examinations had been made. The infected well children (about 28%) were isolated under the care of a nurse in the various school rooms in the north wing of the main building. Especial attention was given to the cleansing of their noses and throats by alkaline washes followed by formalin. Antitoxin in 2,000 unit doses was also administered later.

As soon as the inmates were shown to be uninfected by three successive negative nose and throat cultures they were placed with the uninfected groups which gradually increased in number and were returned mostly to their homes, but partly to the old dormitory which had been thoroughly disinfected. Only two new clinical cases have developed since the completion of the segregation and the disease seems to be pretty well eliminated, although there were many difficulties incident to over-crowding, some difficulties in instructing the pupils, and some due to the facts that the pathological condition of the nose and throat which originally gave rise to the deafness were favorable to diphtheria infection and that the use of the sign language employed were increased opportunities for infection from the hands.

A similar problem was presented at the State Hospital for the Insane, with over 1,000 inmates and employes, at St. Peter, Minn. The executive officer of the State Board of Health and the director of its laboratory had visited the institution on October 15, 1904, to investigate both typhoid fever and diphtheria. The former was easily suppressed, but the latter which had been introduced by a male nurse and later given by him to his fiancee, a nurse in the female wards, was not so easily managed. Dr. Bracken again visited the hospital Nov. 19, 1904, and Dr. Wilson of the laboratory staff accompanied him and remained to inaugurate and supervise practical methods. Here, owing to over-crowding dependent on rebuilding and to the difficulties attendant on the mental condition and filthy habits of the patients the problem was even harder. Without a detailed description a full understanding is impossible, but success has thus far been obtained.

In summarizing this work —

1. An adequate laboratory staff and equipment is essential since only by thorough laboratory examination can the presence of possible danger be determined.

2. It has been found convenient to utilize institutional laboratories when available where the members of the laboratory staff of the State

Board of Health can examine cultures on the spot when there is urgent need of haste.

3. Repetition of examination of both nose and throat specimens is advisable in all cases and especially when suspicious bacilli are found.

4. The types 3D, C and A are the virulent and important types of bacilli.

5. The individuals must be grouped into —

(*a*) Those showing clinical diphtheria.

(*b*) Those infected with types C, D or A but show no clinical symptoms.

(*c*) Those showing other types until by later examination they are definitely sown to be free of types D, C or A.

(*d*) Individuals who have been shown to be free of all diphtheria bacilli in both nose and throat. This group gradually increases in numbers.

(*e*) The uninvestigated groups in which the individuals should be kept from coming in contact with each other so far as possible, between the time of the taking of the specimens and the receipt of the report thereon. Every effort should be made to prevent exchange of nose and throat bacteria between individuals until it is definitely known whether they are infected or not. In infected individuals the bacilli will be eliminated more quickly the greater the approximation to individual isolation.

6. It is unsafe to place hitherto uninfected individuals who develop sore throat with clinical cases of diphtheria. They should be isolated until examined bacteriologically since they may be infected not with diphtheria bacillus but with streptococcus, the spirillum of Vincent, blastomyces or some other micro-organism, and, therefore may be exposed unnecessarily to diphtheria infection. This has happened repeatedly in the Minnesota investigations.

7. Executive action must be taken on the basis afforded by the laboratory; therefore, it is essential either that these two branches be kept in the closest touch or that in the work of inauguration and supervision of methods a laboratory trained man be placed in charge. After the system is well started, competent local medical authorities may be depended upon for its continuance if they have been sufficiently impressed with the necessity of care in details.

8. That such methods will give satisfactory results and are entirely practicable has been shown in the experience of the Minnesota State

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[1] Wesbrook, Wilson and McDaniel: "Varieties of *B. diphtheriae*" Biennial Report Minnesota State Board of Health, 1899-1900, p. 613: also Transactions of Association of American Physicians, 1900, p. 198.

Board of Health under conditions which present the greatest possible variation. Three epidemics have been thus suppressed in a lying-in hospital in Minneapolis where there was no adequate nursing force, where the women before and after confinement are employed in the housework of the institution, where the babies are left in charge of different mothers at different times and where also the almost daily admission of fresh inmates adds to the opportunities for introduction of infection. A method which had proven satisfactory in lying-in hospitals, boarding schools, schools for the deaf, homes for children, insane hospitals and other such miscellaneous institutions in a climate such as that of Minnesota would certainly seem to be capable of utilization under nearly any conditions which might arise.

9. The experience of Minnesota would seem to point decidedly to the conclusion that diphtheria infection is transmitted usually by almost direct exchange of the flora of the nose and throat.

10. In institutional and school life the more independent the individual and the greater the facilities for individual isolation the greater the freedom from diphtheria infection and the easier is it to eradicate the disease.

UPON THE PRACTICAL UTILITY OF A MEDICAL BOARD TO AID LOCAL SANITARY AUTHORITIES IN THE INVESTIGATION OF INFECTIOUS DISEASES.

By Aristides Agramonte, M. D., of Havana, Cuba.

The present commissions of infectious diseases attached to the various local sanitary boards of the island of Cuba are, I believe, entirely unlike any other branch of sanitary organization outside of the republic; the Havana commission is really of American origin.

Soon after taking possession of the island, the military government appointed a board, then known as the Yellow Fever Board, whose duty it was to visit every case suspected to be yellow fever or reported as such, in the city of Havana and its suburbs; it was through the direct influence of this board that statistics were prepared which may be trusted for their accuracy. At the time of the constitution of the Republic in 1902, the field of action was extended so as to include all cases suspected of infectious disease or where the diagnosis of the attending physician was not absolutely clear and beyond doubt.

By means of this commission the sanitary department reserves the right to question the diagnosis made in all cases of suspected infectious disease; thus we have been safeguarded against false reports of smallpox, yellow fever, anthrax, glanders, etc.

From what I have said my hearers will appreciate the tact with which it may have been necessary to proceed on many occasions, to avoid friction with the families of the sick on the one hand, or apparent breach of medical ethics on the other. We can say with satisfaction, however, that the co-operation of the medical fraternity has been fairly uniform, and most physicians have looked upon the work of our commission as an efficient aid in clearing up some really obscure cases.

The Superior Board of Health has on several occasions called upon the Havana board for advice on questions of public health and regarding cases reported from other parts of the island as of infectious diseases without sufficient fundamental basis for the diagnosis.

Several times members of the Havana board have been appointed to act as special delegates of the Superior health board in distant parts of the island for the purpose of investigating reported cases of infectious diseases, establishing and raising quarantine, reorganizing the local sanitary service, studying local conditions, etc.

The medical man in Cuba, as elsewhere, who must attend a large practice in order to derive a livelihood, can hardly be expected to devote much if any time to the microscopic work which many cases require for their elucidation, even when he possesses the necessary training and equipment for the purpose; it is here that the interference of the infectious diseases commission becomes most advantageous and achieves the best results.

My apology for presenting this paper may be summed up in very few words: there are cases met with in daily practice which, when not thoroughly studied in a painstaking and careful manner, go on record, whether cured or deceased, with a wrong diagnosis; this in many instances may be sorely detrimental to the real sanitary status of the city or country where it takes place and further, that in our little republice we have in a great measure prevented such occurrences by establishing boards such as the one I speak of in the principal cities of the island.

In the following lines it is my purpose, as concisely as possible, to place before you evidence in the shape of a few cases where the error or doubt in diagnosis would have persisted had not the Havana commission undertaken their thorough study at the time they were reported.

[Here followed the clinical notes of five cases examined by the Commission of Infectious Diseases, where the diagnosis had been in doubt.—Ed.]

REPORT OF THE COMMITTEE ON TUBERCULOSIS.

By Dr. LAWRENCE F. FLICK, Chairman, Philadelphia, Pa.

At the meeting of the Association in Chicago in 1893 your committee on the restriction and prevention of tuberculosis made a report in which it briefly expressed the most advanced views upon tuberculosis held at that time and recommended the adoption of certain practical measures for the prevention of the disease. The views then expressed as those of advanced thinkers are now the commonly accepted views of the world at large. The practical measures then recommended have since been tested in part and so far as tested have been found of use. The recommendations then made bear repetition now and were as follows:

1. "The notification to and the registration by health authorities of all cases of tuberculosis which have arrived at the infectious stage.

2. "The thorough disinfection of all houses in which tuberculosis has occurred and the recording of such action in an open record.

3. "The establishment of special hospitals for the treatment of tuberculosis.

4. "The organization of societies for the prevention of tuberculosis.

5. "Government inspection of dairies and slaughter houses and the extermination of tuberculosis among dairy cattle.

6. "Appropriate legislation against spitting into places where the sputum is likely to infect others and against the sale or donation of objects which have been in use by consumptives unless they have been thoroughly disinfected.

7. "Compulsory disinfection of hotel rooms, sleeping car berths, and steamer cabins which have been occupied by consumptives before other persons are allowed to occupy them."

It is something over eleven years since these recommendations have been sent out to the world with the endorsement of this Association. Similar resolutions were endorsed about that time by the Pan American Medical Congress held in Washington and by other medical societies. It is interesting now to note what has been the fruit.

In 1893 registration of tuberculosis was recommended by the Philadelphia County Medical Society for the city of Philadelphia but failed of inauguration through the influence of prominent members of the medical profession. During that same year New York City adopted a partially voluntary and partially compulsory notification. [Biggs.] There was strong opposition to the measure in New York but in spite of the opposition the principle of notification was maintained and in 1897 full notification was established. The example of New York helped to break down opposition and since then Boston, Baltimore, Philadelphia, and probably many other cities, towns and even states have established registration.

Thorough disinfection of all houses in which tuberculosis has occurred perhaps has not been carried out anywhere as yet. In New York City, however, fair progress has been made in this direction. "All rooms or apartments which have been vacated by consumptives either by death or removal so far as the Department can obtain information are either immediately disinfected or renovation is ordered and their occupation by others prohibited until the orders are complied with. Carpets, rugs, pillows, mattresses, and so on are removed by the Department, disinfected by steam and returned." [Biggs.] In other cities less comprehensive measures for disinfection have been inaugurated. In nearly all large cities an effort is now made to introduce machinery and measures for the thorough disinfection of houses which have been occupied by consumptives. As yet no system of registration of disinfected houses has been inaugurated anywhere that the Committee knows of.

Before 1893 there were very few sanatoria for the treatment of tuberculosis. Dr. Edward L. Trudeau, the pioneer worker in the cause, had established the Adirondack Sanitarium in 1884. The Episcopal Church had opened a free home for consumptive women at Chestnut Hill, Philadelphia, in 1887. The Rush Hospital for Diseases of the Chest had been founded in Philadelphia in 1890. A few pay institutions had sprung up in the West and in the South. Since then a number of states have established state hospitals for the treatment of tuberculosis, Massachusetts and New York leading and both free and pay institutions have been established in large numbers all over the country. According to the statistics given in the directory of tuberculosis work about to be issued conjointly by the Committee on the Prevention of Tuberculosis of the Charity Organization Society of the City of New York, and the National Association for the Study and Prevention of Tuberculosis, there are now in the United States and Canada 11 free sanatoria with 505 beds; 26 pay sanatoria with 1570 beds in which the pay is not more then ten dollars a week; 30 sanatoria with 1203 beds in which the pay is over ten dollars a week; 7 free hospitals for consumptives with 527 beds; three hospitals for consumptives with 65 beds in which the pay is not more than ten dollars a week; one pay hospital for consumptives with 12 beds in which the pay is more than ten dollars a week; 38 free hospitals with 2642 beds in which all stages of the disease are taken; 7 hospitals with 164 beds in which all stages of the disease are taken and in which pay is not over ten dollars a week; 14 hospitals with 549 beds in which all stages of the disease are taken and in which the pay is over ten dollars a week; and two free institutions with 69 beds for non-pulmonary tuberculosis: making a total of 139 institutions with 8306 beds. Phenomenal as this growth of sanatoria and hospitals for the treatment of tuberculosis has been it is only a beginning. All over the country there is an activity for the establishment of institutions of this kind which will bring into existence in the near future a large enough number of beds to cope with the tuberculosis problem from this point of view in a thoroughly comprehensive way.

In 1893 there was but one society for the prevention of tuberculosis in existence in this country, namely the Pennsylvania Society which had been organized in April, 1892. Since then such societies have been organized in 19 states including Canada and there are a total of 38 such societies in existence. [Tuberculosis Directory.] Besides these there has been organized a National Society for the Study and Prevention of Tuberculosis. All of these organizations have done and are doing excellent work along educational lines and some of them are doing practical work in the establishment of sanatoria. Besides the organizations which have been established specifically for the prevention of tuberculosis, many societies which have been organized for sociological work have taken up the work of the treatment and prevention of tuberculosis as a side issue.

Considerable has been done in the way of government inspection of dairies and slaughter houses and the extermination of tuberculosis among dairy cattle. "Prior to 1890 there was no systematic effort in any state for the suppression of tuberculosis in herds of cattle. There was very little effective meat inspection in the United States outside of about twelve cities excepting that conducted by the Federal Government. In 1893 Federal meat inspection was in operation in 156 abattoirs in fifty cities. Since the discovery of tuberculin the diagnosis of tuberculosis in cattle has become easier and much more has been done. The State of Massachusetts has endeavored to carry out the plan of testing with tuberculin all cattle of the state and of destroying all cattle reacting to the test. It has found the cost of such a project prohibitive, however. No other state has ventured on such a plan. Several states, notably Pennsylvania, New Jersey, some of the New England States, Wisconsin, Ohio, and Illinois have adopted plans for the repression of tuberculosis by a co-operative system between the state and the owners of infected herds. This system is giving fairly good results and is bringing about a distinct diminution in the prevalence of bovine tuberculosis. Except in Massachusetts there is nowhere in the Union a systematic and periodical inspection of all dairy cows.

"The inspection of animals that are killed for food is now conducted systematically by the Federal Government at a number of the principal slaughter centres. This Federal inspection applies to animals killed in slaughter houses in which meat is prepared for export and interstate trade. A few Southern cities have central abattoirs and systematic meat inspection but in all the other cities and towns in the United States meat inspection is carried out in an exceedingly haphazard way or not at all.

"Milk inspection as practiced in the United States consists almost wholly in an examination of milk for the detection of skimming, of added water, and of preservatives. In a few cities as in Philadelphia, Baltimore and Boston a microscopic examination and rough bacteriological examinations are made. A few cities such as Washington and St. Paul have a systematic examination made of all herds producing milk for sale in those cities. Such examinations are made at intervals of several months but do not include the application of the tuberculin test. Recently, however, in nearly all of the large centres of population there have been established milk commissions of physicians or of other disinterested and competent men who have formulated rules to govern the production of milk of the greatest purity and for the inspection of cattle and premises where milk is produced and of the systems for handling it. Milk produced according to the recommendations of such commissions is known as certified milk. Such milk may be had from one or more farms in the neighborhood of a large proportion of the cities in the Eastern United States. In most cases it is required that the cattle producing such milk shall be shown by the tuberculin test to be free from tuberculosis." [Pearson.]

Legislation against spitting on sidewalks and in some public places has been enacted in many cities and towns throughout the United States. In most places, however, it is merely legislation without enforcement. The legislation, moreover does not cover the most dangerous part of the spitting habit, namely expectoration in enclosed places. So far as known to the Committee nothing has been done in the way of legal enactment forbidding the sale or donation of objects which have been in use by consumptives without disinfection.

So far as known to the Committee nothing has been done in this country for compulsory disinfection of hotel rooms, sleeping car berths, and steamer cabins which have been occupied by consumptives before other persons have been allowed to occupy them. Tracts have been distributed among hotel keepers by the Pennsylvania Society for the Prevention of Tuberculosis instructing them what to do for the protection of their guests against the contagion of tuberculosis. No laws have been enacted, however, and except perhaps in New York City nothing has been done by boards of health requiring sterilization of hotel rooms after occupation by consumptives.

The experience of the last ten or twelve years in preventive work has pretty well crystalized what is best out of former theories and has demonstrated that most of the measures which were recommended by this Association in 1893 should be pursued with vigor. It has also shown that some of the recommendations then made might perhaps advantageously be modified.

It is now universally accepted that notification and registration are essential as first steps in a comprehensive scheme for the prevention of tuberculosis. All cities, towns and states are falling in line on these measures and it is only a question of establishing legal and executive machinery for those which have not yet done so, to adopt them. The importance of disinfecting houses which have been occupied by consumptives is also fully recognized and boards of health everywhere are trying to equip themselves for this work. It is perhaps worth while, however, to again call attention to the importance of an open record of disinfected houses which as yet has been introduced nowhere.

The work which has been done in special hospitals for the treatment of tuberculosis has suggested new lines of work some of which have already been inaugurated in many places. It is now clear that for the economical treatment of tuberculosis there must be five kinds of institutions: First, dispensaries for ambulatory cases; second, sanatoria for incipient cases; third, sanatoria for somewhat advanced cases; fourth, convalescent farms for the employment of persons who have been restored to physical health but have not yet obtained a complete cure; and fifth, hospitals for advanced dying cases.

A number of dispensaries have been established in the large cities and some are being opened in smaller towns. In those dispensaries which have been established it has been demonstrated that many early stage cases can be successfully treated without interference with occupation and ordinary domestic relations. For the treatment of such cases it is necessary, however, to give material assistance in the way of diet as well as medication to people whose scanty means do not permit the purchase of such articles. For many of these people it is also necessary to supply preventive measure materials. Dispensaries are not only of great value in the treatment of tuberculosis but are of unusual benefit in the prevention of the disease. They should be established in every community.

The importance of sanatoria in the treatment and prevention of tuberculosis is so well recognized that little need be said upon this subject. Such institutions are springing up in large numbers all over the country.

It is not so well recognized, however, that hospitals for the treatment of advanced cases of tuberculosis are a most economical measure in the prevention of the disease. The removal of advanced cases from the family and home is a potent factor in the prevention of tuberculosis because it removes the sources of contagion during the time when contagion is most intense. The poor, moreover, are unable to protect themselves against contagion during the last few weeks of life of a consumptive because they cannot command the necessary materials and attendants for such a purpose.

Neither is the importance of convalescent farms for the employment and care of persons who have been treated for tuberculosis and have been restored to a condition of physical health sufficiently recognized. When a person has been treated for consumption he has been removed for so long a time from his particular niche in the social fabric in which he has earned his living that it is somewhat difficult for him to again get back to a position of self support. He is therefore thrown upon the hands of relatives who are unable to maintain him and is exposed to a life of hardship and deprivation which is likely to give him a relapse. As a matter of economy he should have a place in which he can be employed at low wages until such time as he can fall into ranks in the ordinary avocations of life.

Much more should be done by the government for healthy milk and meat and the extermination of tuberculosis among domestic animals than has been done up to the present time. The question of whether or not animal and bovine tuberculosis are inter-transmissible should not influence this subject at all. It is to the interest of the human family that tuberculosis of every kind be wiped from the face of the earth and this cannot be accomplished unless the line of battle be made to extend along the entire front wherever tuberculosis appears. Moreover, it must be conceded that the milk and meat of a sick animal is improper food even though the disease from which the animal suffers be not transmissible to the person consuming such food.

The legislation against spitting unfortunately has missed the mark, probably because there has not been a clear cut understanding of the manner in which spitting contributed to the spread of tuberculosis. If there is to be any legislation on this subject at all it should be such as will prevent consumptives from contaminating houses, clothing, utensils, and such things as have to be handled and as may become media of transmission of the disease to others. Spitting upon the street or on the pavement is of very little consequence in the spread of tuberculosis as compared with spitting in the handkerchief or spitting upon the floor of a house. It is perhaps going too far to attempt to regulate a man's conduct in his own castle and for this reason legislation upon the subject of spitting probably will never accomplish much good. There should, however, be inaugurated everywhere an active campaign against the distribution of expectorated matter of any kind. People should be taught that all broken down tissue of the body and all abnormal secretion of mucous membranes are apt to be disease-bearing and should be destroyed in the interest of human happiness and safety. Very few people are willing to jeopardize the lives and comfort of others knowingly and there is reason to believe that the majority of mankind would be willing to amend habits in this matter if properly informed upon the subject.

Disinfection of hotel rooms, sleeping car berths, and steamer cabins is not of primary importance in the crusade against tuberculosis but is ethically desirable. We now know that implantation of tuberculosis requires a much longer and more intimate exposure than is ordinarily possible in hotels, cars and steamers. Very susceptible persons, however, might contract the disease in this way and this is an additional reason besides the ethical one why individuals and corporations who have to do with such places and conveyances should be required to give absolute protection to their guests and patrons.

In addition to the specific recommendations here given and reiterated it might be well at the present time for the Association to urge upon the public the importance of better housing of the poor both in their places of abode and in their places of occupation; better control of the food supply at large; and more definite instruction in the schools and on the platform of diet for the working people. The home and workshops are really the centres from which tuberculosis is distributed and they at the same time are strong predisposing causes of the disease by reason of their unhealthfulness. Bad and adulterated food and improper selection of food by the individual are also strong predisposing causes by lowering vitality.

In conclusion your Committee would suggest that every member of the American Public Health Association act as a committee of one in his own home to help organize the campaign against tuberculosis.

SUPPLEMENTAL REPORT OF COMMITTEE ON TUBERCULOSIS.

By Dr. MARSHALL L. PRICE, of Baltimore, Md.

The committee feels that in view of the continuous advances being made in the control, restriction and cure of tuberculosis, a more or less concrete view of the whole situation should be presented by the committee at frequent intervals to this Association, not only that the members may be made acquainted with past and present conditions but that the channels along which future advances may be made may be clearly shown. The crystallization of the principles of prevention and control into appropriate legislation has much to promise for the future. A brief review may be given of the present status of the legal control of tuberculosis, and a rough estimate of its probable effectiveness. As is well known this control concerns two main lines of action: 1. Restriction of tuberculous infection derived from animal sources. 2. The restriction of tuberculosis, derived from human sources. (The contention of Koch does not concern a certain general application of the principles specified under the first head.) In the restriction of tuberculosis derived from animal sources only those animals commonly used for food are considered in the usual legislative measures. These are the flesh of cattle, sheep, swine, poultry, and the milk more especially of cows. The only considerable amount of tuberculosis among these animals is found in cattle whose flesh and milk represent the greatest source of danger in foods. The dangers from tuberculous milk are out of all proportion greater than those from tuberculous meat; the particular dangers of the former being due to the raw state in which it is usually ingested and the suspension of any virus which it may contain in a fine, fatty emulsion. The regulation of infection through animals is practically comprised in the legal regulation of bovine tuberculosis, and comprises, (*a*) inspection of milk and flesh sold for food, (*b*) the frequent inspection and testing of herds to determine the existence of tuberculosis in the cattle comprising them. A few states employ both methods, some one of the two, and many of them neither. Statistics on the legal control of bovine tuberculosis are not available, as the various legal regulations concerned have been compiled without distinction of kind or degree.

Control of *human* tuberculosis has no doubt the greatest possibilities to promise in the future prevention of a large proportion of tubercular infections among the human race. This statement has sufficient evidence to place it on the strongest possible grounds of probability. A definite finding is still impossible of the proportionate dangers of two probable factors — human and bovine tuberculosis — in the dissemination of tuberculosis in man. The legal restriction and control of tuberculosis in the United States has attained a varying development in the several states of the Union. Not in all of them is it proceeding along the same lines, and not always along proper lines. In the inception of a state movement for the restriction and control of tuberculosis a logical and essential step first in order is the appointment of a commission to make a careful and thorough preliminary survey of the ground and to lay the foundations upon which the completed structure is to be erected. This procedure has been followed in most of the states which have made recent movements against tuberculosis. Georgia is the latest state to appoint a tuberculosis commission. Other states having commissions engaged in the investigation of tuberculosis are Minnesota, Wisconsin, Rhode Island, Ohio, New Hampshire, Vermont and Maryland.

The second preliminary to active legal measures should be the formation of unofficial state societies or of local associations for the relief and control of tuberculosis. Among the oldest state societies are those of Pennsylvania and Ohio. One of the most recent organizations is that in Maryland. Very effective civic societies exist in New York, Chicago and Boston. The most practical results of these societies are accomplished along the lines of education and charitable assistance, although one of the most valuable functions of such an association is the power which it possesses of influencing public opinion and the moral aid and support which it gives public officials in the performance of their duties. In the civic control of tuberculosis New York may be recommended both now and in the future as a model which other cities may well follow. It must be confessed however that the results of the legal regulation of tuberculosis have not yet equaled the expectations of the over-sanguine and inconsiderate. There are several reasons why this should be the case. It appears that most cities have laid undue stress on the propagation of tuberculosis through expectoration and other means of dissemination in public places, and have either tacitly ignored the prolonged and dangerous exposure to which the people are exposed in their own homes, or have been unable to provide against it. It is evident that in order to reach the root of the matter the sanitary jurisdiction must be brought into contact with the homes of the tuberculous patients. Under these conditions not only are 90 per cent. of consumptives brought into relation to the sanitary authorities but they are under surveillance at a very early stage of the disease. The particular nature of the communicability of tuberculosis makes it evident that as it is in the house that infection arises and in the house that it is disseminated, the house must therefore be the proper point of attack. Though this is now being recognized and appreciated, the task of bringing the sanitary jurisdiction and the home into contáct possesses so many difficulties and dangers that many sanitarians have hesitated to make any attempt to bring about such a condition. These obstructions are not insuperable, however, if it be recognized that direct relations between the state and the home are practically impossible. These relations may be brought about in a less direct manner. When the inevitable obstructions have been successfully surmounted the sanitary executive will have the satisfaction of knowing that he has arrived at a point where he can put his ax to the root of the tree and no longer be content with the small results to be obtained by chopping away at the branches.

An absolute essential to the effectiveness of any legal regulations is proper and effective registration. This is very frequently the most serious of all the obstacles. Past experience has thoroughly demonstrated that effective registration is only possible with the aid of popular and professional sentiment in its favor. The first measure having to do with prophylaxis proper is a complete system of disinfection. At present disinfection is only performed when the source of infection (in other words, the consumptive) has been removed from the premises by death or by change of habitation. A law recently devised by Dr. Fulton, and now in effect in Maryland, probably meets these two preliminary requirements better than any legislation yet formulated. Concerning registration and disinfection of tuberculosis Maryland sanitarians have felt that the successful result of any endeavor to combat tuberculosis must involve the application of the necessary regulations synchronously over a considerable area; in other words, through the state rather than the local administration.

All of the recent Maryland legislation has been devised on the plan of centralization, although local autonomy is as far as possible preserved. The widespread extension of such a movement prevents the occurrence of a discouraging and rather hopeless situation such as may occur when the efforts of the community are nullified by the failure of a nearby community to do its part. For example, St. Paul may have an excellent system of local regulation of tuberculosis, and Minneapolis, just across the river, may be doing nothing whatever either to restrict or control it; and conversely, in this way, one city may largely negative the efforts of the environing community. A system of state jurisdiction also makes provisions for citizens living outside the boundaries of the cities and larger towns. The New York system, while the best system now existing for the civil regulation of tubercular diseases, can necessarily only be applied to a certain class of the population.

An essential part of the direct municipal control of tuberculosis as practiced in New York City is the system of "sanitary surveillance." There are many objections to be made to the system in practice, and the excellent results obtained in New York can be largely ascribed to the peculiar nature of the population, both racially and as regards its domiciliary condition. Methods very successful in New York will meet with a limited success in other communities. The method of direct surveillance will only reach in any community a certain proportion of the consumptive population even if it contain a large tenement population, as is the case in New York. Osler estimates that 90 per cent. of the total number of consumptives in any community must be treated in their own homes. This is even more true as regards prevention, which must be applied at the earliest possible stage of the entry of the disease into the household.

While the efforts to produce a cure largely concern the individual when the question of prevention arises the efforts of the state are best applied, not to the individual, but to the family. The extension of tuberculosis must nearly always be through the family (considering the term in the sense used in the United States Census Bureau for persons occupying a common domicile). We have, as soon as the question of prevention arises, no longer a sick individual, but a sick family. Efficient registration of tuberculosis should always include data relating to the family, as well as to the individual.

The question of disinfection is always closely allied to registration, and is one of the principal and most immediately apparent objects of the latter.

Disinfection is most important after the source of infection has been removed, and hence is particularly necessary either (*a*) after the death of the consumptive individual, (*b*) after the removal of the consumptive family.

If it can be insured at any time that the premises occupied by a consumptive, then infected, can if disinfected be maintained thereafter in a non-infected state, disinfection should be carried out while the *tuberculous family* is continually occupying the premises.

Disinfection should frequently include mechanical cleansing, repapering, painting and other renovation, and the free use of caustic soda and soap. These are preliminary to disinfection proper, which is best accomplished by formalin fumigation in the usual manner.

The Maryland act for the registration of tuberculosis and the disinfection of the premises after the death or removal of the consumptive occupant is abstracted below. Certain new sections are added to Article 43 of the Code of Public General Laws of Maryland, viz., Sections 34G, 34H, 34I, 34J and 34K:

SECTION 34G provides that the State Board of Health shall keep a register of all persons affected with tuberculosis.

Under this section all persons known to be affected with pulmonary or laryngeal tuberculosis are to be registered. The register to remain under the sole and exclusive control of the State Board of Health. The contents are not to be disclosed nor are any particulars to be communicated concerning the persons registered therein, except to the proper officials of the state.

SECTION 34H provides for the notification of tuberculosis by superintendents of institutions. Penalty for failure to notify.

This section provides for the weekly return by the superintendent or other person in charge of any hospital, dispensary, school, reformatory or other public institution, of all cases recorded during the preceding week. Superintendents of the institutions are required to record the name, age, sex, color, occupation, social condition and residence of any person suffering from pulmonary or laryngeal tuberculosis within forty-eight hours after its recognition.

All these records are to be delivered under seal to the State Board of Health, on the Monday immediately following the week in which the records were made. Failure to comply with the provisions of this section is a misdemeanor, punishable by a fine of not more than $25.

SECTION 34I provides for the notification of tuberculosis by physicians. Penalty for failure to notify.

Reports are required from all physicians practicing in the state of all cases of pulmonary or laryngeal tuberculosis under their professional care. The physician is required to transmit, within seven days, the name, age, sex, color, occupation, social condition and residence of any person so diseased. Failure to comply with the provisions of this section is a misdemeanor, and is punishable by a fine of ten ($10).

SECTION 34J provides for the disinfection of premises after the death or removal of the consumptive occupant, before such premises can be let for hire. Penalty for failure to notify of death or removal of the occupant, and for letting without previous disinfection.

The apartments occupied by any consumptive shall be deemed infected, and shall be disinfected by the local board of health on the death or removal of the consumptive occupant. The local board of health must be notified of the death or removal of the occupant within forty-eight hours after its occurrence. Fine of $10 is provided for failure to comply with the provisions of this section.

Section 34k provides penalty for renting apartments occupied previously by a consumptive before their disinfection.

This section provides a penalty for any one who lets for hire, or causes or permits any one to occupy apartments previously occupied by a consumptive, before such apartments shall have been disinfected by a board of health. Violation of the provisions of this section is a misdemeanor, punishable by a fine of $25.

The provisions of this law successfully executed will attain proper registration and an amount of disinfection which it is usually practical everywhere to accomplish at a reasonable cost. Disinfection is the first step in securing the practical results of registration, and it is an essential preliminary to the other measures in the prevention of tuberculosis. Disinfection is by no means a preventive panacea, as it only concerns what we may consider the *infective* side of tuberculosis and does not affect its communication by *contagion* or contact. In any further procedures we are brought to face again the principle that we have a *tuberculous family* rather than a tuberculous individual to deal with, and it is the former rather than the latter that we have to treat. The previous tendency has been to treat a *tuberculous community* rather than a *tuberculous family.* We are now in a position to state that the former method involves in many cases an unnecessary diffusion of our endeavors, in other words, the tuberculosis problem presents itself in a simplified form, as *the protection of the non-tuberculous members of the tuberculous family* (using the term family again in the sense in which it is understood by the United States Census Bureau). The measures directed against the accomplishment of this object (among which is disinfection) may be summarized under the term *"family regulation"* of tuberculosis, a part of which is individual and refers to the patient, and part refers to the family unit. The New York method is addressed mainly to the individual, and may be summarized under three heads: 1. Sanitary surveillance of the patient. 2. Removal of patient for treatment. 3. Such general advice and directions may be given by the inspector in a single visit. The objections to a general application of this system, which has produced such admirable results, are mainly as follows: 1. Only the tenement house and lodging house population is provided for. 2. The inspector cannot be acquainted with the individuality of his family. 3. The continuous observation and advice necessary to success cannot be secured. These objections apply to New York City, as well as to other communities, but an additional objection to the application of the New York plan elsewhere is that it requires considerable modifications for its application in communities with populations not largely composed of tenement and lodging house dwellers, and further that it is not applicable to rural communities. It is the latter for which it has been the particular endeavor of the Maryland law to provide.

An abstract and brief analysis of the Maryland law is given below:

This law is entitled,—"An Act to Protect Citizens of Maryland from Certain Communicable Diseases, Especially Tuberculosis of the Lungs and Larynx," (Chap. 399, Acts of 1904).

SECTION 1. Provides that the disposal of sputum, saliva, or other bodily secretion or excretion, in such a manner as to cause offense or danger to other persons occupying the same house or apartment,—is a nuisance. Penalty for failure to comply with notice to abate nuisance.

The provisions of this act apply to promiscuous spitting, in pneumonia, influenza, and pulmonary and laryngeal tuberculosis, and may be extended by resolution of the State Board of Health, to other diseases communicated by means of the sputum, saliva, or other bodily secretion of excretion. This penalty for failure to comply with the notice of the local board of health to abate such nuisance is a fine of ten dollars.

SECTION 2. Provides that it shall be the duty of the physician, attending any case of pulmonary or laryngeal tuberculosis, to provide for the safety of all other individuals occupying the same house or apartment. If the physician is unwilling or unable to assume these duties, they become incumbent upon the local board of health.

SECTION 3. Makes it incumbent upon the attending physician, to report on the condition of the premises, and to further report, what precautions recommended, he has taken and ordered. When all precautions necessary to insure the safety of the household have been taken to the satisfaction of the local health authorities the latter issue and order for $1.50) upon the State Board of Health, in the physician's favor. The physician is furnished the necessary supplies for this purpose, upon his requisition. A circular of information is likewise furnished.

SECTION 4. Provides a penalty for false and fraudulent returns of data relating to tuberculous persons, false certification as to precautions and prophylactic measures, the return of non-tuberculous persons as tuberculous or the return of fictitious individuals. These offenses are classified as fraud, and are punishable by a fine of one hundred dollars, or to imprisonment not exceeding six months or both the fine and imprisonment.

SECTION 5. Appropriates $5,000 annually to secure the provisions of this act, and provides the manner in which it may be executed.

The sum of $1.50 is paid to attending physicians from this appropriation under Section 3.

The first section is an application of the common law principles of nuisance, to the special dangers of tuberculous infection.

This is a real and vital danger, and indivduals exposed to it have the same right to protection, as against the storage of dynamite and other explosives on the premises.

The need of some means of meeting this condition, has been felt in many of the communities which are actively combatting tuberculosis. New York and Boston have provided against it indirectly, by ordinances authorizing the authorities to remove specially dangerous cases to the municipal hospitals.

The reports required from the attending physicians upon the condition of the premises, include in addition to the usual personal data (age, sex, occupation, etc.) the following: —

ECONOMIC DATA. *a.* Is the patient engaged in the original occupation? *b.* Is the earning power as good as ever? *c.* If working irregularly or at reduced wages, how long? *d.* If totally disabled is the patient confined to bed? *e.* Consumption in the family history?

GENERAL DATA. *a.* Number of children living and dead? *b.* Are there infants or young children in the house? *c.* If the patient is a mother does she nurse an infant? *d.* Does the patient habitually kiss other persons on the mouth? *e.* Does the patient use dishes, tableware, pipes, clothing, handkerchiefs, or towels in common with other persons? *f.* Does the patient prepare the food of the family?

DISPOSAL OF THE SPUTUM. *a.* Does patient spit upon floor, walls, hearth, or furniture? *b.* Does patient spit into a spittoon used by other persons? *c.* Does patient spit into handkerchief, into paper napkin? *d.* Into paper sputum cup? *e.* Into china, glass, or metal sputum cup? *f.* Is water, carbolic acid, or any disinfectant used in sputum cup?

FINAL DISPOSAL OF SPUTUM. *a.* Is sputum burned? b. Is it thrown into water closet or sewer? *c.* Is it thrown away with garbage, ashes, or other refuse? *d.* Are patient's handkerchiefs put in wash with other clothing? *e.* Are patient's handkerchiefs disinfected before being laundered?

CONDITION OF THE ROOM. *a.* Is the room suitable in size, ventilation, and lighting for a tuberculous person? *b.* Are hangings, floor coverings, and furniture such as admit of proper prophlaxis? *c.* How are walls finished (rough plaster, smooth plaster, wainscoting, paper, painted?) *d.* Are walls and furniture ever wiped off with disinfectant solution? *e.* Is room swept and dusted in the ordinary way with broom and feather duster? *f.* Are floors ever washed with disinfectant? *g.* How many other persons occupy patient's bedroom? *h.* Does anybody share the patient's bed? *i.* Is patient's bedroom used as a kitchen, as a dining room? *j.* Do children play on floor of bedroom? *k.* Other conditions dangerous to those on the premises or to the public?

This law is now in effective operation in Maryland, and has thus far manifested an efficiency exceeding the expectations of all of those interested in its passage. It is believed that this law will strike the root of the tuberculosis problem, a result that has evidently not until now been possible for the following reasons:—

1. The *family regulation of tuberculosis* is effected, by dealing with the tuberculous family rather than the tuberculous community or individual.
2. The protection of the family is put in the hands of the attending physician, who by his relations and long acquaintance with the family is the only person in a position to practically accomplish it.
3. The means to make measures of prevention effective (prophylactic supplies) are furnished to the *tuberculous family*.

MEASURES TO BE ADOPTED IN THE STRUGGLE AGAINST TUBERCULOSIS.

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Amongst the diseases that decimate humanity, there is none that in our day causes greater losses than tuberculosis, especially in its pulmonary manifestations. In civilized countries, a full seventh part of the total number of deaths may certainly be attributed to this disease. Nevertheless, the statistical investigations that have been undertaken to ascertain the ravages of the Koch bacillus in different countries, have demonstrated, of late years, a slight tendency to a decrease. Mexico has now entered on this stage of evolution as can be seen from the following data which we take from "the defence against tuberculosis" by Dr. Liceaga.

TABLE SHOWING GENERAL MORTALITY AND DEATHS FROM TUBERCULOSIS IN THE CITY OF MEXICO, FROM THE YEAR 1869 TO 1903.

Year.	General Mortality.	Deaths from Tuberculosis.	Percentage.
1869	7,447	369	4.95
1870	7,733	412	5.32
1871	7,640	425	5.56
1872	8,172	484	5.92
1873	6,971	632	9.08
1874	8,453	601	7.10
1875	7,217	556	6.13
1876	10,390	621	5.97
1877	12,242	813	6.64
1878	10,161	785	7.72
1879	10,223	807	7.89
1880	9,455	808	8.54
1881	9,687	781	8.05
1882	11,523	962	8.34
1883	12,047	919	7.64
1884	12,083	958	7.92
1885	13,067	1,058	8.09
1886	13,102	1,158	8.83
1887	18,200	1,152	8.72
1888	13,218	1,154	8.73
1889	15,426	1,124	7.93
1890	16,851	1,364	8.09
1891	14,303	1,270	8.87
1892	16,320	1,595	9.77

TABLE SHOWING GENERAL MORTALITY AND DEATHS — CONCLUDED.

Year.	General Mortality.	Deaths from Tuberculosis.	Percentage.
1893	19,509	1,787	9.15
1894	15,532	1,446	9.30
1895	14,050	1,338	9.52
1896	15,406	1,518	9.85
1897	16,201	1,569	9.68
1898	18,067	1,531	9.47
1899	17,783	1,703	9.57
1900	18,438	1,860	10.08
1901	21,743	2,013	9.25
1902	19,461	1,907	9.79
1903	17,035	1,654	9.70

According to Dr. George F. Keene, of Rhode Island, the United States pay an annual tribute of 100,000 lives to this terrible scourge.

The entire world is ravaged by this horrible plague and pays a tax of two lives per minute, or 3,000 per day or say 1,095,000 per annum (Knopf).

Tuberculosis can only be propagated, when we combine the Koch bacillus which produces it, a system that lends itself to the cultivation of the parasite and a solution of continuity, excoriation of the mucous membrane, or of the skin in the same system.

This specific body is not reproduced, even when intentionally inoculated, excepting those bodies that as a consequence of certain diathesis which they carry, produce in the cellular protoplasm, substances that are only just commencing to be isolated by the chemical-biological agents, which serve as mediums for specific cultivation of this microscopic organism, or to delay the phagositary action of certain cells with which we are fully provided and the destructive action which is also special to these cells which are provided with liquids that are worked up in this cellular protoplasm.

These conditions, which are indispensable to the reproduction of the disease we are now studying, have been brought about by individuals who are subject to certain intemperate habits, such as alcoholism; who have suffered privations and certain diseases that predispose to chloro-anemia, or to the inheritance that can be transmitted by a debilitated condition that facilitates the necessary elements already referred to.

The struggle against tuberculosis should therefore be reduced to a struggle against the bacillus which produces it, procuring its destruction immediately before it gets dry and converted into dust, attending to the sick and giving immunity to those systems in which it can be cultivated, so as to exhaust its reproduction.

In order to carry out these precepts, we necessarily require the help and individual effort of every tuberculous patient, as well as that of those individuals who have any predisposition to that disease, and in order to obtain these individual efforts, it is necessary to obtain a list of the persons suffering from this disease, showing those who suffer from open tuberculosis and those who suffer from closed tuberculosis. This list should commence with the declaration or information of the cases, that physicians, school directors, chiefs of workshops, of commercial houses, asociations of all kinds and heads of families are bound to make. The declaration should also be compulsory on hotel and boarding house keepers, as well as on the proprietors of houses which have been occupied by tuberculous persons. It should also be compulsory on the persons who suffer from this disease, or on those who depend on them, to send the sputa to the supreme board of health, so as to know whether they do or do not contain the Koch bacillus, or in other words, whether the patient is suffering from open tuberculosis or not.

An excellent method for obtaining the registry of tuberculous persons and their cure at the same time is the organization of special dispensaries for these patients.

These dispensaries are greatly in request amongst tuberculous patients because besides the necessary medicines for the cure, they furnish gratis, the treatment of the disease by means of the proper food, and the patients there receive the prescribed rations of meat and milk, the quantities of which are prescribed after a study of the period the disease has run, the patient's constitution, weight, etc., etc. Attracted by these gifts of medicine and food, those who are sick and even those who are not, freely present themselves for examination and this circumstance affords a magnificent opportunity to prepare the register which is so necessary in the struggle against the disease.

In order to procure good work from them, these dispensaries should not only comply with the hygienic conditions that are proper in buildings that are intended, even if only provisionally, to receive patients suffering from a transmissible disease, but should also contain a large waiting room with wooden chairs along the sides for the use of the patients, and upright cuspidors with an automatic water service and discharge, so that they could easily clean themselves by opening a valve in the pipe.

To the right of this room, and opening into it, should be an isolated room with a good light that would serve as laboratory, for which reason it should be equipped with all the necessary resources for making bacteriological analysis of the sputa, urine, radiography, laryngology, etc., etc. This would be followed by another room in the same conditions, provided with platform scales on which to weigh the patient every fortnight; another room for the distribution of food that would be equipped with marble table and shelves; and finally the pharmacy with its necessary equipment.

On the left side of the entrance hall should be a room for the secretary's office, and beyond this, two rooms for the patients who require a consultation, followed by dressing rooms and water closets. These dispensaries facilitate an exact knowledge of the residences of all the regular patients, as well as of those that succumb.

Once that an exact knowledge is obtained by these means, of the tuberculous patient, we are able to rely on his good will, and his co-operation to which he is kept up by the gifts of medicine and especially of food, steps can be taken for the destruction of the sputa with a warning to the patient of the danger to himself and to the persons who come in contact with them, principally of his family, of expectorating in any other place than in the model cuspidors which he finds himself obliged to use during his stay in the dispensary.

The patients who have resources will be advised to use pocket cuspidors when out of doors, so that they may not expectorate on the pavements of the streets, or into cuspidors that are not properly prepared to receive the expectoration of tuberculous patients, which should always be destroyed or mixed with antiseptic liquids.

Every person suffering from tuberculosis ought always to expectorate in some vessel which is properly arranged for the purpose, and which preferably should be made of some metal, so that it may not easily break, and which should be half filled with water or with a liquid disinfectant, so that the expectoration may not be scattered about. In the absence of metallic cuspidors, vitrified clay vessels could be used. These cuspidors should always be within reach of the public, as is now done with urinals.

At the request of its president, the distinguished Dr. Liceaga, the board of health has fully made known the necessity of making use of the cuspidors, and the day is not far distant that by this means the plan proposed will be fully realized.

The persons who are suffering from open tuberculosis and whose sputa it is impossible to isolate and destroy, should isolate themselves in special hospitals, of which the idea is a sanatorium, or in special wards of the ordinary hospitals, and in the absence of these, in private houses. These patients ought never to be allowed to live in company with those suffering from any other disease or with sound persons, and even those persons who attend to them, should be selected from amongst tuberculous patients. The isolation of these patients should be made complusory by law.

The suppression of the expectorations on the public streets could be done by means of wet sweeping at night, and with machines that would absorb the dust instead of scattering it, as is done by the present pattern of brooms. I have already insisted on the necessity of providing vessels on the public streets to receive the expectorations, and these vessels ought to be placed where urinals are erected.

For the sweeping of the rooms occupied by tuberculous patients brooms ought to be employed that are provided with boxes to absorb the dust, and as often as possible, with that new apparatus that disinfects surfaces by means of a vacuum.

The railroad and tramway cars should also be disinfected with great frequency and cleaned every day.

The children of persons suffering from open tuberculosis should not live with their parents when the sputa of the latter can not be conveniently and promptly destroyed, because the absorption of that sputa in the form of dust, produces in them some one of the forms of the same disease from which the parents suffer. These children should be attended to with tonics and strengthening preparations, and also taken to places that are well ventilated and where there are no accumulations.

In some countries, so called summer colonies have been established in country places, that have given very good results, and the children sent there have notably increased in weight, and have lost that predisposition to the disease with which they went there. These children should be subjected to moderate, methodical, and progressive exercises, taken daily in the open air. These methodical movements constitute the training that conduces to a hardening of the system, and diminishes its susceptibility to injurious influences, that a strong constitution can face without danger. The children should also be taught how to breathe in the open air. A methodical respiratory exercise increases the capacities of the lungs to an extraordinary degree and thus confers immunity on the children who were formerly imminent candidates for pulmonary tuberculosis. The chlorotics and anemics should be attended to in order to prevent their contracting tuberculosis.

Almost all physicians who have studied tuberculosis, have been surprised to find their patients suffering from anemia. But in this connection betewen tuberculosis and anemia, which of the two diseases is it that predisposes to the other? Is it tuberculosis, as asserted by Hayem, which is the occasional origin of certain forms of chlorosis, or is it the chlorosis that affords an appropriate field for the development of this and many other diseases? I am disposed to accept the latter hypothesis, which is based on the influence of the general processes on the local organ, that is to say, that outside of the traumatic lesions of the organ, we have reasons to suspect that the others have originated in the protoplasmatic disturbances that have been caused by the irregularities in the distribution of the nutritive juices, and because it has been demonstrated, that all affections which favor enervation, also increase the susceptibility.

In all cities there are more or less extensive populated zones in which tuberculosis prevails to a greater extent than in other parts, and this is not only due to the greater density which always favors the causes of contagion, but also to the fact that inhabitants of these districts are physiologically weaker as regards the disease, and also that the germs are also more numerous in those parts and find a field that is well prepared for their development. The attack on these elements which are so favorable to the development and strength of the tuberculous microbe, result in an increased resistance of the soil for the cultivation of the seed. This attack ought to be directed towards the establishment in these houses and districts of ventilation, drainage, paving of the streets and yards, with disinfection and purification of all the dwellings that are or have been unhealthy.

It has now been ascertained with absolute certainty, that wherever these services are established, there is an immediate decrease in mortality, and an increase in the average duration of life amongst the inhabitants of the city. There is not and cannot be any problem of greater importance for a city than the establishment and development of these services.

Once the sanitary chart is methodically completed, we will see a proof of the undeniable conclusion of Brouardel: "If there are cities in which the tuberculous mortality is greatly elevated, these cities do not constitute a block in which all points are attacked; analyzing the results given by statistics, we find wards in the cities which are more rudely attacked than others; in these wards which are comparatively more unhealthy than others, there is often an excessive mortality from tuberculosis, which is thus carried from the city to the ward, from the ward to the block where it at once discovers the unhealthy house."

As the demographic study of a city demands a knowledge of the influence that may have been exercised in its mortality by the establishment of a house water supply, drains and connections of the latter with the street sewers, it is necessary to study the connection between the number of inhabitants whose houses are supplied with drinking water and house drains, with the general mortality.

In those large cities in which crowding is a consequence of the high price of land, a powerful resource for the struggle against tuberculosis will be found in the construction of houses for the poor and working classes to be placed under the management of benevolent societies. This employment of the capital of private charity will give better results than when employed in sanatoriums or hospitals, because the former employment prevents the individual from getting sick, whilst the latter waits for misfortune to come in order to remedy it.

The construction of hygienic houses in the areas that are known to be infected, is therefore one of the most adequate means for strengthening the soil against the tuberculous field, and a means for reaching this end more promptly, will be found in the condemnation of those houses on the ground of public utility, in order that they may afterwards be converted into healthy dwellings.

Besides the resources that can be furnished by benevolent societies or mutual aid societies an insurance ought to be provided against disease. These things have been understood by the most advanced nations, and we see that in Germany an essentially social country, a great number of hospitals and sanatoria have been erected by mutual aid societies which are made up of workmen; companies that insure against sickness for the invalids and all persons which are maintained both by the compulsory contributions of the workmen as well as by those of the employers, who contribute to the expenses without receiving the benefits, so that a workman sees that the proceeds of this tax do not go to the public coffers to cover general expenses and that in case of an accident or of old age he knows that he can count on the resources that do not proceed from either individual or state character, but from his own capital, and as he is the principal shareholder, it is to his interest to avoid disease, even in his companions, so as to prevent any decrease in the receipts from his own business. This is how these institutions foster hygiene and constitute the best prophylactic against disease.

In order to organize all these resources for the struggle against tuberculosis, it is necessary to organize "The Mexican league against tuberculosis," under the patronage of our progressive government and in which the noble ladies of our society would take a prominent place, and occupy themselves specially in the propaganda of all these resources for the struggle against this terrible disease. With this assistance, the well meditated measures already adopted by the supreme board of health, will very soon be realized.

Dr. Liceaga has already in numerous pamphlets, of which one is called "Defence against tuberculosis," and later on in a communication addressed to this Association, has said: "In order that in Mexico we may reach a similar success, it is necessary to undertake a crusade not only of official recommendations such as those that have been made by the board of health, but to carry a conviction of the unquestionable efficacy of hygiene against tuberculosis, to all the public authorities, medical societies, charitable and mutual associations, commercial and industrial syndicates, workmen's societies, families, individuals, and in one word to the entire world. By what means can we reach these results?

It can be reached by teaching, by education and by an active propaganda. These resources have been found efficacious in New York, in Brussels and in Buenos Ayres, and they must be so in Mexico, if we make a firm resolution to follow the path shown by those towns.

THE ANTI-TUBERCULOSIS LEAGUE OF HAVANA AND ITS WORK.

By Dr. JOAQUIN L. JACOBSEN, Havana, Cuba.

First. To obtain an exact idea of what the society is it is only necessary to read its rules and regulations. In them are defined its character and its purposes with all exactitude.

This society, founded in Havana in October, 1901, as a delegation of the "Liga Argentina de Buenos Aires" (Argentine League of Buenos Aires), had for its first care the establishment of representation in the different provinces, with the object of establishing the organization in all the Island of Cuba. Its first work was accomplished in the time of the intervention; and it is but just to concede that the American Government gave to our society its moral and material help, and contributed greatly to its progress; the chiefs of American sanitation not only observed with interest our work, but took part in it and regularly attended all its sessions. The project of a popular sanatorium for poor consumptives in the suburbs of this city, which the League embraced with warmth (and which has not yet been realized), was the idea of Col. Havard, at the time the chief of sanitation of the Island, who not only selected the place, but also obtained from the government sufficient credit ($17,000) to buy the land where it should be installed. It is the property "La Asuncion" in the highway of Arroyo Naranjo, four kilometers west of the city. The house of representatives has approved a credit of $150,000 to build the sanatorium and as soon as the same is approved by the senate the work will begin.

Col. Havard obtained from the League a credit of $50.00 per month with which sum he commenced to publish a monthly periodical, "El Boletin de la Liga," against tuberculosis, an organ of propaganda which reflects all the works of the corporation, and which is issued in great numbers and distributed free throughout all the Island.

The League, although a private society, should have some official influence, for its works to have more value; this is recommended by its by-laws. Dr. Havard directed his attention to this point and finally obtained for the League representation in the Superior Board of Sanitation, organized in virtue of Military Order No. 159. In the constitution of said board one of its speakers is the President of the League. Beforehand Dr. Furbush, chief executive of sanitation, prepared the grounds for the naming of a commission of four members of this League as advisors of the sanitary department in matters pertaining to tuberculosis. To Dr. Furbush is due the credit for the first dispensary for tuberculosis, created in February, 1902, with the name "Special Sanitary Dispensary." To the organization of this the League contributed efficaciously. In the month of March of said year, Sir Fernandez de Castro ceded to the League the necessary land for a maritime sanatorium on the coast of Jaruco within ten leagues of Havana. The League, not having the means to build the sanatorium, placed the land at the disposition of the government; and, as is seen, it has not cared to utilize the offer.

The League, with the object of properly attending the various works that pertain to it, established the following sections: of propaganda, of the press, of clinical studies and of experimental studies. The section of propaganda organized at first popular conferences, and to the effect that almost all the active members have made use of the work in the interior of the corporation or in the parlors of the societies of recreation and amusement of the city, kindly offered for this object.

In the cigar factories also there have been accomplished works of active propaganda for the associates. The League has furthermore occupied itself, since it was first organized in Cuba, with the insurance against tuberculosis, adapting to this country the measures which have continued so successful in Germany of protecting the working man, and offering him means of defence in case of sickness. The conferences have been repeated; there have been numerous interviews with the chiefs of unions; many of our sessions have been dedicated almost entirely to this matter; and, after all the results do not appear to correspond to our efforts. It does not seem probable at present that this institution can be established with our working men.

This society has utilized diverse methods of propagation to teach the public the means of defence against consumption. It has distributed at various times placards, cards, postals, chromos with maxims and beneficial advice, and, by invitation of Dr. Furbush, compiled the placard against consumption in 1902, of which thousands of copies have been distributed and are still being distributed in the sanitary department.

The League has always held monthly sessions and all necessary extraordinary sessions at first in the Special Sanitary Dispensary, ceded for this object by Dr. Furbush; afterwards in the parlors of the Academy, in the house of its president, and finally, at the place of the new dispensary, which has been founded in this city and which is sustained with the resources supplied by the provincial council of Havana. The last mentioned corporation ceded, first, a credit of $1,000 and afterwards voted a sum of $2,400 per annum, with which quantities the League has operated since the month of May of last year, regularly in

Havana, the second dispensary for tuberculosis. The subscriptions are increasing in number.

The League has not forgotten its scientific character, and it has promoted interesting discussions and read numerous works, publishing almost all in its official periodical. It has been in relation with the chiefs of charities and health departments, with the object of promoting efficacious measures for the benefit of the consumptive; of the first it has solicited the isolation of consumptives in hospitals, a measure which is now in force in some of these establishments; of the second, the organization of a special tuberculosis service and the application of sanitary measures, which have been executed.

Infractions of hygiene have been repeatedly reported by its associates, especially those committed in cigar factories.

To the sanitation of the habitation the society has also given attention, and to the government of intervention presented plans for the construction of hygienic tenement houses, and also hygienic houses for the working man. The League, lastly, with the object of calling attention to the studies of tuberculosis, founded an annual prize of $150. There have already taken place, with success, two drawings, and the time for the celebration of the third is drawing near. As the measure has increased in importance, its responsibilities have become greater. To meet these, there have been contributed, in addition to the assessments, $600 (Spanish silver).

The city hall of Havana has given, up to now, $50 monthly, and has lately offered $1,500 per annum.

The League maintains cordial relations with the committee of the International League of Buenos Aires; has named up to now corresponding physicians, reputable professors in New York, Barcelona and Paris, who illustrate its bulletin with works of notable interest; has been represented and has sent works to the International Congress of Madrid and to the Conferences of Charities held on the Island of Cuba.

Finally, I may say that, notwithstanding the small resources at the disposition of the society, in view of the work it ought or pretends to realize, it holds its own ground, disposed to continue its own efforts and increase all it can its sphere of usefulness.

REPORT OF COMMITTEE ON THE BACILLUS TUBERCULOSIS IN MAN AND ANIMALS.

BY DR. MAZYCK P. RAVENEL, CHAIRMAN, PHILADELPHIA PA.

Since our last meeting several important pieces of work have been reported. The first of these is the Interim Report of the Royal Commission on Tuberculosis appointed in 1901. This Commission consisting of Sir Michael Foster, Chairman; Profs. Sims Woodhead, Sidney Martin, John McFadyean, and Rupert Boyce, took up the question of the relation of human and bovine tuberculosis under the following heads:

1. Whether the disease in man and animals is one and the same.
2. Whether animals and man can be reciprocally infected with it.
3. Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favorable or unfavorable to such transmission. The report says:

We have up to the present made use, in the above inquiry, of more than twenty different "strains" of tuberculous material of human origin, that is to say, of material taken from more than twenty cases of tuberculous disease in human beings, including sputum from phthisical patients and the diseased parts of the lungs in pulmonary tuberculosis, mesenteric glands in primary abdominal tuberculosis, tuberculous bronchial and cervical glands, and tuberculous joints. We have compared the effects produced by these with the effects produced by several different strains of tuberculous material of bovine origin.

In the case of seven of the above strains of human origin, the introduction of the human tuberculous material into cattle gave rise at once to acute tuberculosis, with the development of widespread disease in various organs of the body, such as the lungs, spleen, liver, lymphatic glands, etc. In some instances the disease was of remarkable severity.

In the case of the remaining strains, the bovine animal into which the tuberculous material was first introduced was affected to a less extent. The tuberculous disease was either limited to the spot where the material was introduced (this occurred, however, in two cases only, and these at the very beginning of our inquiry), or spread to a variable extent from the seat of inoculation along the lymphatic glands, with, at most, the appearance of a very small amount of tubercle in such organs as the lungs and spleen. Yet tuberculous material taken from the bovine animal thus affected, and introduced successively into other bovine animals, or into guinea pigs from which bovine animals were subsequently inoculated, has, up to the present, in the case of five of these remaining strains, ultimately given rise in the bovine animal to general tuberculosis of an intense character; and we are still carrying out observations in this direction.

We have very carefully compared the disease thus set up in the bovine animal by material of human origin with that set up in the bovine animal by material of bovine origin, and so far we have found the one, both in its broad general features and in its finer histological details, to be identical with the other. We have so far failed to discover any character by which we could distinguish one from the other; and our records contain accounts of the post-mortem examinations of bovine animals infected with tuberculous material of human origin, which might be used as typical descriptions of ordinary bovine tuberculosis.

Kossel has made also a further report of the work done at the Gesundheitsamte in Berlin, in studying these same questions. Up to the time of this report fourteen per cent of the cultures of tubercle bacilli isolated from human sources have produced general tuberculosis in bovine animals by sub-cutaneous inoculation. Two of these cultures were isolated from miliary tuberculosis of the lungs.

At the laboratory of the State Live Stock Sanitary Board of Pennsylvania a third instance of infection with the bovine bacillus has been found. The case was that of a child not quite two years of age, who had been nourished the greater part of its short life on cow's milk, bought from the most convenient store. It developed a large abdominal tumor, which proved on autopsy to be a tuberculous new growth involving the mesenteric glands and intestine. The lungs were not involved. Cultures were obtained from this tumor, which had the cultural and microscopic characteristics of the bovine bacillus, and proved fatal to a calf weighing 211 pounds in 35 days.

Your committee does not yet feel able to say with what frequency bovine infection of man takes place, but it is evidently not a rare occurrence. We consider that the evidence going to show that such infection does take place is absolutely conclusive, and that it not only justifies, but makes imperative, the passage of stringent laws by municipal and state authorities for the suppression of tuberculosis in cattle, and the prohibition of the sale of meat and milk from tuberculous animals.

REPORT OF COMMITTEE ON DEMOGRAPHY AND STATISTICS IN THEIR SANITARY RELATION.

By W. A. KING, Chairman, Washington, D. C.

The following is a report of progress in continuation of the efforts of the American Public Health Association co-operating with the U. S. Bureau of the Census and other agencies to improve the vital statistics of the United States and finally establish them upon a basis of accuracy, uniformity and thorough comparability that will make them of the greatest possible service to the practical sanitary workers of the country as well as available for international comparisons and fully respected abroad.

EXTENSION OF PROPER REGISTRATION METHODS.

Obviously the first and most pressing direction of effort is the extension of adequate registration laws over the large area of the United States that does not at present possess them. The assistance of the American Medical Association has been especially requested in this connection, and that Association has co-operated, through its Public Health Committee and by means of resolutions commendatory of certain phases of the work, in promoting the end sought. Effort has been made to secure the active co-operation of the state and local medical societies in connection therewith.

In recommending legislation the principles adopted by this Association and published by the Census Bureau in a special pamphlet have been accepted, and it is hoped that conformity with them may obviate some of the defects that have previously rendered attempts at legislation of no effect. In their practical application, as was clearly stated in the original report on the subject, some modifications in the draft of the law given in that pamphlet have been made in order to make them acceptable to local requirements, but the general principles have so far not required change.

During the past year registration bills have been introduced in the legislatures of several states, and in one, Iowa, a law providing for the immediate registration of births and deaths has been passed. This law is brief, makes burial or removal permits compulsory throughout the state, and if effectively supported should without question yield fairly satisfactory results and add that state to the registration column as having an effective registration of deaths.

In Ohio and Mississippi success did not attend the bills introduced. The problem of registering vital statistics is a peculiarly difficult one in the South — all honor to the State Boards of Health of Florida, Alabama, Louisiana and other states that have courageously attempted it there — but as to Ohio, there is surely no other state, not even Pennsylvania, for which the prospects of passing a successful law ought to be better. The conduct of registration is at present in the hands of the secretary of state, and the bill introduced was prepared after conference with him and with the State Board of Health. There would appear to be no serious difficulties in the way, and every member of this Association and every sanitary worker in the state should endeavor to use his personal influence that public sentiment may be so awakened and directed that a good law may be passed without fail in 1906.

In Florida, the State Board of Health has adopted "Rules" embodying the requirements of the specimen registration law referred to above, including the standard certificate and will request the next legislature to give additional force to them by enactment into statutory law.

Favorable action is looked for during the present year in several states, and more especially in Pennsylvania, where an earnest effort will be made by the State Board of Health, Associated Health Authorities and Sanitarians, State Medical and State Homeopathic Societies, the press and other agencies to pass an effective registration law for both births and deaths. The first general law for vital statistics in Pennsylvania was enacted in 1851, and although among the first state laws for this purpose passed in the United States, its plan was broad and comprehensive and the detailed items required for the reports of births and deaths were very nearly identical with those embraced in the standard certificates indorsed by this Association and recommended for use at the present time. Unfortunately it failed in some of what are now considered essential principles — the requirement of local registrars, burial permits, and compulsory filing of certificates before disposition of the body — which were not as thoroughly understood at that time as at present, and the law proved to be wholly inoperative. Various substitutes have been tried, but without satisfactory results, until we come to the present year, when the recent horrors of Butler and the child murders of Philadelphia have taught press and people that modern communities cannot safely exist without registration of vital statistics, both as a sanitary protective measure and as a deterrent of crimes.

In his paper on "Butler's Lessons," read before the Associated Health Authorities and Sanitarians of Pennsylvania at Gettysburg, in 1904, Dr. Benjamin Lee, Secretary of the State Board of Health, calls attention to the fact that in the history of sanitation "every great calamity is also a great opportunity," and as the second of his practical conclusions and recommendations based on the study of the disastrous local epidemic, urges "the adoption of legislation compelling the reporting of deaths and communicable diseases in all cities, boroughs and townships, and the registration of the same at the Central Bureau of Vital Statistics." The meeting unanimously passed the following resolutions, which are quoted especially in this connection for their references in the previous work of this Association in indorsing a standard form of certificate of death, and for the final clause, which expresses in the most unequivocal manner the fundamental position that vital statistics should occupy as the basis of every thoroughly effective, modern and progressive system of public health:

> Whereas, The accurate registration of vital statistics is an indispensable requisite of an efficient modern public health service, and
>
> Whereas, The Congress of the United States, by joint resolution, has called upon the authorities of the various States to co-operate in establishing such registration; therefore, be it
>
> *Resolved,* That we, the Associated Health Authorities and Sanitarians of Pennsylvania, assembled in annual meeting at Gettysburg, May 26, 27, 1904, do hereby most earnestly recommend to the next Legislature of Pennsylvania that a law be enacted which shall provide for the thorough and complete registration of vital statistics throughout the entire State, and especially that all deaths, with the causes of deaths, be recorded, by means of standard certificates as recommended by the U. S. Census Bureau and American Public Health Association, and that burial or removal permits be issued prior to any disposition of the body;
>
> *Resolved,* That a special committee of three members of this Association be appointed to co-operate with the State Board of Health and Vital Statistics of Pennsylvania, committees of the State Medical Society, of the American Medical Associaton, and with the U. S. Census Bureau, in drafting and supporting a satisfactory bill for this purpose; and
>
> *Resolved,* That the achievement of the registration of all deaths, with their causes, immediately after their occurrence, and the prompt return of certificates of death from local registrars directly to the central bureau of vital statistics which shall constitute a part of the organization of the State Board of Health, thereby giving the sanitary authorities of the State timely information of the exact prevalence and distribution of disease, is the most important of all sanitary measures and should be unremittingly urged until successfully carried out in this State.

Besides Pennsylvania, which is foremost in importance to the vital statistics of the country on account of its vast population not heretofore represented upon our registration records, bills or amendments to existing law framed more or less closely in accordance with approved principles will be presented in the legislative sessions this winter in Florida, California, possibly Washington and Oregon, Kentucky, Montana, Idaho, Wisconsin and Michigan (for births only in the last named State). The attention of sanitarians all over the country should be directed to the movements in these various states, and a helpful hand extended whenever possible.

In considering the feasibility of obtaining fairly complete registration of vital statistics in states not possessing it at present, we may sharply divide the field at the outset, so far as our present prospects are concerned, into two distinct lines of effort: (1) registration of births, and (2) registration of deaths. The registration of births is quite as essential to a perfected system of vital statistics as the registration of deaths, and many states have endeavored to secure such registration, and it would seem that until public sentiment shall have advanced until it will require and compel strict compliance with laws imposing the duty of registering all vital data and will support the enforcement of the penalties necessarily attached to such laws, without the sentimentalism that permits neglect of the public interest when brought into conflict with the personal convenience of individuals, that it will be difficult to secure thoroughly effective registration of births.

The tendency among state authorities undertaking such legislation is to be too ambitious. Not realizing the difficulties that have been encountered in other states, it looks easy, theoretically, to plan a system that will accomplish both ends. No harm is done provided the efficiency of the provisions for registering deaths are not impaired. But if inability to secure complete returns of births leads to lack of confidence in the law and relaxation of efforts to secure its effective enforcement respecting deaths also, then the result will be complete failure and discouragement, whereas if the work were begun in a moderate way, going on by steps that have been thoroughly tested, and securing an approximately complete registration of all deaths before an attempt is made to secure all births, a brilliant success might be attained in both respects. *The impartial administration of a good registration law for deaths is the best means of preparing the people of a state to demand and support an effective law for births.*

Two great difficulties seem to stand in the way of the general extension of adequate laws for the registration of mortality statistics over the United States. These are (1) sparse distribution of population, and (2) large proportion of colored population. The first difficulty applies chiefly to the states of the Far West. The second difficulty affects all the states of the South, from Delaware and Maryland to

Texas, and is dependent upon the high percentage of illiteracy found among the colored population.

The principles of registration of vital statistics formulated by this Association have been based upon past experience in registration states. All of these states have belonged to the New England, Middle or North Central groups, with high or medium densities of population, a considerable foreign element but practically no colored population, and a high degree of literacy, wealth and facilities for intercommunication dependent of thick settlement. Can we expect to extend such registration to states that do not possess similar conditions?

As to the sparsely settled area, some encouragement is given by Colorado, if we may be permitted to accept general impressions of the effectiveness of registration in that state. The standard certificate of death is used, very slightly modified in form and made out in duplicate. The procedure of registration is clearly explained in a letter from Dr. C. E. Cooper, Secretary of the Colorado State Board of Health, an extract of which we quote:

> Every undertaker, firm, corporation or individual, and this includes saw-mills, retail lumber dealers, etc., which have anything to do with the disposition of any dead human body (this includes interment, selling coffin, making pine boxes, incineration, etc.) are supplied with these certificates. They are compelled by law to fill in same, submit it to the attending physician for his certification, and to the local health officer for permission to bury, ship or otherwise dispose of the body. Of course, most of our business is transacted with undertakers, but we occasionally have to do with retail lumber companies making boxes. The undertaker must then forward to this office direct the original certificate properly filled out, and must also forward to the clerk of the locality where the death occurred the duplicate certificate, that is, to the county or town clerk. In this way we receive our returns directly. We do not have them collected for us by the county or town clerks, and, above all, we have the original, and the duplicate exists in the clerk's office. Monthly comparison between our records and those of the clerks enables us to keep check not only upon our files but also on the clerk's. One of the most prominent causes of this system's effectiveness is that we license our undertakers. In this way we have control over them, and, should an undertaker refuse to comply with the law, his license is sacrificed. Health officers are the first to receive the certificates ;that is, they go to them before they come to the central office. They are instructed to refuse permission to bury, ship, etc., unless the certificate is properly completed as to the cause of death and the various other information desired.

It is also the duty of the health officer, according to instructions printed upon the back of the certificate, to exhume the body in every case of interment without a permit, a provision similar to the Indiana law. For cities or towns, the course of registration would seem to be similar to that in most registration states, but for territory outside of incorporated cities and towns the county health officer and the county clerk have jurisdiction.

The active efforts made by Dr. Porter, Secretary of the Florida State Board of Health, give encouragement as to the improvement of registration in that state, and Maryland, also, a state with a considerable proportion of colored population, is now claimed by Dr. Fulton to be fully entitled to be considered a registration state.

In this connection the question arises — How to determine whether a state has reached a sufficient standard of accuracy in the registration of vital statistics, and this question will be given thorough consideration by your Committee.

CLASSIFICATION OF CAUSES OF DEATH.

The International classification of causes of death is now generally employed in the registration offices of the United States, Canada and Mexico, and it is a pleasant feature of the acceptance of this International system that we find it here employed in the statistics of Cuba, and it has been for a considerable time past. The system is also used in Porto Rico, as well as in practically all of the countries of North, South and Central America employing any system of classification.

The manual issued by the U. S. Census Bureau has proved to be a very convenient method of insuring a high degree of uniformity, at least in the classification of singly returned causes of death. When two or more deaths are reported on a single certificate, the problem of proper and uniform classification is a difficult one, and attempts have been made in several different ways to devise some simple and convenient solution.

The plan of employing rating values of the several titles, and also of the terms included under each, which has already been referred to before this Association and before the Section on Hygiene of the American Medical Association, has been reduced to a form available for practical use and comparison in the daily service of registration offices.

In the list prepared for this purpose the number of individual terms has also been considerably increased over that in the manual issued in 1902, and combining values are given for each individual term referring to the titles of the International Classification, so that a uniform system of preference can be exercised.

It is too much to expect that such a method at its outset will not present some anomalous cases requiring further consideration and re-rating, and extended comparisons will be desirable with former rulings. It is hoped, however, that it will aid in placing this very unsatisfactory part of registration work upon a satisfactory basis, and that some of the conclusions expressed as to relative importance of titles and terms may serve an important purpose in the revision of the whole classification.

In connection with the matter of revision, we may refer to the recently revised Virchow Classification employed in the Prussian Bureau of Statistics and used generally in Germany, which excellent classification has reached a considerable degree of correspondence with the International system.

In a letter from the President of the Imperial Board of Health of Germany to the Director of the Census, on the subject, he says:

> "At the conference that prepared this classification and at which the commissioners of all the larger states of Germany were present, the International Classification of Causes of Death was also considered, but its adoption was deemed inexpedient. Yet, while the International Classification was not adopted, every effort was made to approach it as much as possible, and a long step was taken in this direction. As the International Classification and our classification are coming closer and closer together, I still hope that at some not far distant day we shall have some uniform classification."

This desire, which has animated the members of this Association during the entire history of its efforts for the promotion of uniformity in this respect, will be highly appreciated, and there should be an effort made to agree in as many respects as possible with the views considered essential by the German authorities, as well as by those held by the English Registrar-General in his latest revision, so that the difficulties in the way of the union of these countries with the countries employing the International system may be obviated as much as possible.

In conclusion, this report has been one of progress, and, as we believe, fairly satisfactory progress during the past year in the direction of making the vital statistics of the United States worthy of the place they should occupy. It is not a report of complete accomplishment in any one respect. The difficulties are too many and too arduous to be removed by the efforts of a few years. But we believe that we are working in the proper way, enlisting the co-operation of all available agencies, and that the time must surely come when American vital statistics will no longer be a reproach to the inhabitants of our land. It is a vastly harder task than it is in countries where a general law can be enforced by one central authority. Under our institutions the independent actions of the legislatures of all of the different states must be harmonized, and it is extremely difficult, amid all of the varying conditions, to secure even a fair degree of uniformity and identity of procedure and result.

It is encouraging, on this the first visit of the American Public Health Association to Cuba as the guest of the nation lately born and but recently added to the group of countries which our Association represents, to find a national system of vital statistics in operation and in purpose, methods, employment of the International classification of causes of death, and other important respects, such a system as the American Public Health Association has been striving to build up in the older countries of the organization. We have more accurate and more timely information of the mortality in Cuba, as presented in the bulletin,

> "Informe mensual sanitario y demografico de la Republica de Cuba"

issued each month by our honored President, Dr. Carlos J. Finlay, Chief Santiary Officer, than we have for almost any state in the Union. The Spanish terms in the nomenclature of causes of deaths are strange to some of us, except our members from Mexico, but the ***numbers*** of the International Classification are familiar to us all, and give a practical illustration of the value of International agreement. Cuban sanitary work is based upon exact mortality statistics, and we must all come to recognize the fact, in practice as it has long been recognized in theory, that the only sound foundation of public health methods is a complete, accurate and timely registration and return of deaths.

THE TEACHING OF HYGIENE IN COLLEGES AND NORMAL SCHOOLS.

By SENECA EGBERT, A. M., M. D., Philadelphia, Pa.

Those of you who were present at the meeting of the Association in Washington a little more than a year ago, will recall the report of the Committee on the Teaching of Hygiene, and the subsequent discussion by Drs. Starkey, Sternberg, Hurty, Probst and others.

In the course of this discussion, Gen. Sternberg said "I think the report did not dwell sufficiently upon the importance of teaching hygiene with the broadest meaning of that term, in the higher schools and colleges. There should be a professor of hygiene in our leading institutions, where advanced students are taught," and this was almost the only reference to this important phase of the subject, although others did refer to the courses leading up to the degree of Doctor of Public Health that had been established in a few universities.

This question of hygiene in the larger colleges and universities has been much in my mind for several years, and I feel that it is deserving of more consideration at your hands. Were it being discussed before another body, say one made up of laymen only, it might be necessary to first determine whether a knowledge of the practical hygiene of the individual, home, city and state should, at this day, be considered an essential part of the education and culture that our college students are supposed to receive from their respective institutions, but I assume that argument with you upon this point would be superfluous.

However, if you will study the announcements, and the curricula set forth in them, of any considerable number of our higher institutions of academic or scientific learning, you will find that, as far as the general student body is concerned, hygiene has almost no place in the scheme of instruction and that, apparently, the powers that be in such institutions do not consider it necessary or advisable that it should have such a place. I do know that certain of our larger institutions, such as Yale and the Massachusetts Institute of Technology, do offer courses in sanitary engineering, and that others such as Purdue and Ohio State University, referred to by Drs. Hurty and Probst, have made preparations for courses leading up to the public health degree, but what I wish to emphasize at this time is the importance of a general education in broad hygiene of the entire college and university student body. I also wish, if time permits, to call attention to the lack of the same kind of instruction to the pupils in our normal schools where the future teachers of our public and private schools are being educated, trained and developed.

By the courtesy of the Commissioner of Education for the United States I have had advance sheets of his report for 1903, from which I have taken the following data:

The total number of institutions included under the head of universities, colleges and technological schools is 627, of which 129 admit women only and 43 are schools of technology. Women are admitted to at least 26 of the latter schools, and to 323 of the 455 other universities and colleges.

The total number of under-graduates and resident graduate students in the 627 institutions for the session of 1902-3 was 114,130, of whom over 82,000 were men and almost 32,000 women. The above does not include the 11,036 students in the summer schools maintained by 51 of the universities and colleges.

It will doubtless interest you to know that 27 of the enormous total of 114,000 were pursuing courses in sanitary engineering and that I do not find that this degree, or that of doctor of public health, was conferred upon any of the graduates in that year, (1903). The schools offering courses in sanitary engineering are the University of California, Yale, University of Illinois, Purdue, Massachusetts Institute of Technology, University of Michigan, University of Missouri, Cornell, Columbia, Union, University of Oregon, and University of Wisconsin. Harvard has in its announcement for 1904-5 also offered a half-year course in water supply and sanitary engineering and another in heating and ventilation for their students in engineering.

However, I find that the only schools reporting students actually enrolled in the sanitary engineering courses are Yale 7; University of Illinois 8; Massachusetts Institute of Technology 12.

I could find no data in the report that would indicate how many of the 114,000 were receiving instruction in hygiene, either as part of the regular course, or as a specialty, and I accordingly wrote for information on this point to more than a score of leading institutions and made careful study of the published announcements which some sent in reply and of others that I had at hand.

I do not wish to make invidious comparisons and I admit that the choice of schools made the subject for inquiry may be unfortunate, but I believe the following will convince you that there is scarcely an institution in the country that supplies to practically all of its under-graduates a course in hygiene that would appeal to you as being in any way sufficient for a man or woman of fair culture and education. The secretary of the Harvard Faculty of Arts and Sciences writes:

"There are three courses in this subject which may be taken by undergraduates in the College and in the Scientific School. There is also a programme of instruction in anatomy and physiology which leads to the degree of bachelor of science, and which is designed for those who intend to study medicine. In the separate courses of instruction in anatomy, physiology and hygiene, 153 men are registered this year; 26 men are taking the programme of instruction in anatomy and physiology in the Scientific School." That is 153 of possibly 3,000 students have elected this work as part of their education, and 26 (36?) of the 562 men registered in the Scientific School are thus anticipating their future study of medicine. But let us see what is comprised in the courses taken by the 153. Referring to the announcement, we find that hygiene includes lectures and laboratory work on elementary anatomy and physiology, personal hygiene and emergencies, that this is the only course on the subject that can count for the degree of A. B., and that the other two courses are respectively upon anthropometry and upon applied anatomy and animal mechanics, both being given by Dr. Dudley A. Sargent, Director of the Gymnasium.

From Yale University I have a catalogue of the Sheffield Scientific School and a letter from Prof. Russell H. Chittenden, in which he writes: — "I should say the average number of men per year pursuing sanitary engineering is ten or twelve, although it varies greatly, sometimes a much larger number and sometimes smaller." This for a school of 779 undergraduates. And I can find nothing referring to a course in general hygiene required of, or open to either academic or scientific students.

From Columbia University I have announcements which indicate that it offers an apparently excellent course in sanitary engineering, but, so far as I can learn, no course in general hygiene. However, according to the report of the Bureau of Education already quoted there were no students enrolled in the session of 1902-3 for the degree of sanitary engineer. At the University of Pennsylvania, few, if any, of the undergraduate students seem to take advantage of the elective course in hygiene, which consists of laboratory work upon problems relating to the atmosphere, water, foods, clothing, disposal of sewage and refuse, etc.

At the Columbian University at Washington our subject seems to be ignored, except in the medical department, and as concerns water supply and sewerage in the course in engineering. So at the University of Virginia, it is only a part of the medical course, and likewise at Tulane University and, apparently, at the University of Michigan.

Prof. Locy, of the Northwestern University, tells me that "Our director of physical culture offers a short course in hygiene in the College of Liberal Arts. There are other courses given in the Medical School, but, on the whole, little attention is given to hygiene, etc., in our University. I wish our course were more extensive." Prof. Rockwood, of the State University of Iowa, says, "There are given in this university in hygiene and sanitary science; 1st, a course of about 25 lectures on hygiene, mostly attended by students of medicine; 2d, A course of 36 lectures on sanitary engineering; 3d, a course of 54 hours on the chemical analysis of water; 4th, a course of 54 hours on the chemical testing of foods."

At the University of Chicago I find no mention of anything resembling hygiene in the courses for undergraduates, except a lecture on the "Physical Care of the Body" and another on the "Growing Nervous System," these being given in the Department of Household Administration.

At Cornell University the course is one covering two hours per week during the first half year of the session, but it is apparently devoted entirely to personal hygiene and physical culture, and it is also apparently entirely elective or optional, as it is open to all students.

At the University of Texas the entire work, outside of the department of medicine and of engineering, seems to be included in the term physical culture and so on.

Bucknell University, at Lewisburg, Penn., has a fair course in hygiene, thanks to the energy and persistence of the head of the department of organic science there, Prof. George G. Groff. Here however, not all the students are required to take the course, as it is only an elective of the junior year. As we have heard, the Massachusetts Institute of Technology has a course on sanitary engineering, and a most excellent one it is. In fact, I know of no school in the country where one can get such extensive and thorough instruction in the many important phases and problems of our science, although the course of Yale is also a very good one. But, I have still to learn that even a small amount of teaching in this line is given to the whole student body of the Massachusetts Institute.

Perhaps the best course in the country, from the point of view I am taking, is that given at Princeton University by Gen. A. A. Woodhull, an army surgeon of large experience in sanitary affairs and doubtless known to many of you by his writings. Here all students who are candidates for the degree of bachelor of arts, bachelor of science or civil engineer, are required to take the course during a part of the freshman year, the lectures comprising elementary anatomy and physiology and the general care of the body; the principles of exercise, clothing and ventilation; the action of tobacco and alcohol; avoidable diseases and their consequences, and the essentials of first aid. Gen. Woodhull also gives an elective course to seniors, which includes water supply, sewerage and ventilation, building sites, preventable diseases in connection with the public health, and the elements of public hygiene. This elective should be a required course, but the one now required is of no mean value, since practically every student thus receives some instruction in matters pertaining to the care of his own health and that of others; and since there was a total of 380 freshmen registered for the three degrees in the session of 1903-04.

One curious feature of this subject is that, so far as I can learn, none of the institutions require any knowledge of anatomy, physiology or hygiene as part of the entrance requirements. They thus either assume that their prospective students, no matter where or how they are prepared, must have had a satisfactory education in these subjects, or else, since the latter are not included in the collegiate schedule, they would have us believe that hygiene and all that relates to it has no part in the domain of education and culture.

Should we present this dilemma for consideration to the authorities of the respective institutions, I take it that most, if not all, would reply that they did consider our science one that should be included in the required schedule of each college and university, were it not that it must give way to others of more importance to the student seeking an education and of higher relative value in the scheme of pure culture. Is not the basis of choice for a college course mental training rather than pure culture? May I not ask whether we are not somewhat to blame for this conception, since we permit the general, and even the so-called educated, public to persist in the narrow view that the science is confined within the narrow limits of personal hygiene and that it can be fully discussed and comprehended in a few short lectures on anatomy and physiology and certain trite phases of the care of the body. In a sense, when we teach personal hygiene, we teach selfish hygiene. What is needed is that we should give to others and especially to our educational authorities, the view that hygiene is essentially altruistic, that its scope comprises not only the entire physical environment of man but his heredity and his posterity unto even the third and fourth generations, and that there can be no solution of the problems pertaining to the family, to sociology or to good civic government until its principles are well known and understood, and that these cannot be had without general, thorough and systematic instruction.

I have not time now to discuss with you the insufficiency of this teaching in the average high or preparatory school. You know that few, if any, of the students entering our colleges or universities have had instruction of the kind or extent to which I refer. From my own experience, I do not believe that the deficiency can be made up to them by any course which will require less than an entire college year. Just where it should be placed in the curriculum would probably have to depend on local circumstances, but though the average freshman is too young and inexperienced to profit as much by it as he would later, proper teaching thus early would be of benefit to him later in his course and, besides, on account of the number that drop out of the colleges before completing the curriculum and coming to graduation, the earlier the course in hygiene, the greater the total that will be instructed.

These are but details, however, to be settled later. The first thing necessary is to make people understand that the educated man or woman should know not only how to care for himself, or herself, but what constitutes a healthful home and what is needed to improve the physical and civic conditions surrounding one so that the health of the community may be ensured and improved, happiness and comfort secured and life made safe and long.

What is the use of establishing college settlements, if those that dwell therein have only the crudest information and erroneous ideas as to the prevention of diseases and removal of their causes, and of the factors depressing the vitality of those whom they would serve, and if their very ignorance in these matters diminishes their influence for good in many ways? Why should we elect educated college men to positions of trust and power in our cities when they do not know as much about municipal sanitation and what it means for the people, as many of the unlettered "practical politicians?"

As I have told you, we have over 114,000 young men and women in our educational institutions of college or university grade.

According to the report, from which I quoted, 12,279 men and 4,258 women received their degrees at the end of the session of 1902-03.

Suppose we ignore the others, even though half as many, that also terminated their college work in this year on one account or another. and suppose that we could know that these 16,000 graduates had been well educated in hygiene; that they knew, as they have a right to know, practically as much as we here know of its fundamental principles and practice, with an annually increasing number to augment their power and influence for good from now on. Would we not feel that there was hope of securing practical results in the near future in the solution of sanitary problems of city and state that now seem hopeless?

May I suggest, therefore, that this Association take action looking to the framing of resolutions to be sent to every university, college and technological school in the United States, urging that they give this question of the teaching of hygiene the thought and consideration it deserves?

We could then feel that the fault does not lie with us and that our influence had been exerted to overcome the existing apathy and inertia.

Some of you doubtless heard the excellent paper on "The Relation of Public Health to Other Sciences,"[1] which Professor Sedgwick of the Massachusetts Institute of Technology read at the International Congress of Arts and Sciences at St. Louis last September. Had I no other argument, this paper alone furnished weighty reasons why hygiene should be included in any scheme of education in the modern sciences or for the development of men who desire to be of service to their fellows.

After noting that there had been "no close relationship between public health science and the other sciences, such as physics, chemistry, climatology, engineering or education, until the time of Pettenkofer and Angus Smith," and after remarking on the services rendered to the public health by sanitary chemistry, scientific architecture and engineering, he "asserted that all the schools, high and low, technical and general, even the medical schools, neglected the subject of public health.

"If the personal conditions of medical training rendered such instruction impracticable, then the public would have to turn to some other source for proper sanitary legislation and administration."

May we not use this argument to further our cause and by using the term "Public Health" instead of "Hygiene" may it not be possible to awaken some of the educational authorities to the importance of the science. We need care little for the name, if we can secure the desired results.

If you will bear with me, I would close this paper with but a few words concerning the teaching of hygiene in normal schools. Much that I have said about the colleges applies to them with even greater force. Normal school students are supposed not only to be getting an education, but are also the agents that are soon to teach and train our children. The child in school is in a plastic state. Six, eight or ten years of his life, during its most impressionable period, is to be under the care and control of those who are now presumably learning the duties belonging to the profession of teacher. We naturally desire that the minds and morals of our children shall be well developed, but unless we are entirely lacking in sense, we should have the same care for their physical bodies? Are the normal students learning something of this in their novitiate and studentship? Let us see.

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[1] From an abstract in American Medicine, Oct. 8, 1904; p. 622.

According to the report of the Commissioner of Education, from which I have already quoted, "the number of students pursuing teachers' training courses in the several classes of institutions for the year 1902-03 was 88,003," of which number 49,175 were in public normal schools, 14,939 in private normal schools, and the remainder in other public and private institutions.

Thus, there were at least 64,000 students in normal schools in addition to the 114,000 in the colleges and universities of which we have been speaking.

Of the 49,175 students in the public normal schools, the report states that only 10,606, or 21.57 per cent., were studying school hygiene, and more than half of these were in the North Atlantic Division, which includes only the New England States, New York, New Jersey and Pennsylvania. I can find no data in the report indicating the number or the proportion of the students in private normal schools, nor of those taking normal courses in other institutions, that are including hygiene in their work, but we have no reason to suppose and can only hope that the percentage is higher than in the public normal schools.

But are the courses in hygiene that the fortunate 21 per cent. of the pupils in these schools are pursuing, of the right kind and quality?

How many of you know of a single normal school in which the instruction in this science suits your ideas or meets with your approval?

A short time ago I wrote to the Superintendent of Public Instruction in my state inquiring if some means could not be taken to secure legislation that would permit an improvement in the methods of teaching hygiene in the fifteen public normal schools of the state, and he at first replied as follows: "There is so much difference in regard to the teaching of physiology and hygiene that I see no prospect of legislation at this time." This led to further correspondence, including the discussion of teaching hygiene in the public schools, and in later letters he says: "I am forced to the conclusion that your point of view is correct. And I am convinced that some of the instruction which you outline could be grasped by pupils in our high schools." "Much time is spent upon so-called nature study. The information which the children get is worse than scientific hash. Whether the teachers, or the pupils are to be blamed is the question. Pupils first learn to know facts as isolated units, then they learn how to interpret language and to put thought into language, and later they learn to think relations, not mere surface relations, but the relations which constitute science. What is science? Primarily it is the knowledge of things and their causes. Now this is what you desire taught with regard to health and the prevention of disease. It is at this point that our public school instruction is radically defective. Undoubtedly the simpler facts about the structure, the organs and the functions of the different organs of the human body must first be taught; otherwise hygiene and its terminology will always be a source of confusion like the Tower of Babel. Undoubtedly the pupils in the lower grades can be taught to know the bones, lungs, heart and similar parts. This instruction is given with a fair degree of skill. The laws of health, the prevention of disease, the topics which you refer to — these are beyond the ken of the teachers. How far is this necessary?"

And many others in similar position in other states would write in a a similar way, if they gave honest expression to their thoughts on the subject? But why should the knowledge that affects the welfare of every child and every adult, and the fundamental laws of the science which are comparatively easy of understanding, be beyond the ken of the teachers? Simply because they do not receive proper instruction in their normal schools, and because the science of hygiene, or public health, whichever you choose to call it, is looked upon as of little or no importance. A smattering of anatomy and physiology is taught in a dry, unscientific and illogical manner to the prospective teachers, a few trite rules on the care of the body are thrown in, and the whole called "Hygiene." It is no wonder that they later fail to interest their pupils in a subject in which they themselves have no interest and whose principles and scope they do not understand.

I believe that it is within our province to better the present conditions, both in the universities and colleges and in the normal schools, and I also believe that there are few things that are of so much importance to this Association as the consideration of this entire subject.

We have had almost two decades of research work and many brilliant discoveries have been made; the fundamental principles and laws have been elucidated and established. The science of public health has begun to attain its true dignity. We are achieving glorious results along many diverse paths.

But what blocks the sanitary progress more than anything else is public ignorance, and carelessness as to the simplest laws and factors that govern health and disease. Although we look forward to other and even more brilliant discoveries as a result of original research and although these discoveries will undoubtedly be of value to us, I believe that popular education in hygiene and public health is to-day of greater importance to us as individuals and as a people. If this is true, we have in the colleges and universities on the one hand, and in the normal schools on the other, powerful agencies already at hand for securing a general, thorough and systematic instruction in domestic and public hygiene. Can we not devise means to employ them fully for the good than they can do?

REPORT OF COMMITTEE ON HYGIENE OF DRESS.

By FRANK WELLS, Chairman, Lansing, Mich.

An important characteristic which distinguishes man from the lower animals is that throughout his entire life man must wear artificial clothing, while every animal is endowed with a natural covering of hair, wool, fur, or feathers. Artificial clothing possesses several evident advantages over natural clothing. It can be increased or diminished at will, thus giving the individual power to meet climatic changes of seasons and of localities. It may be removed for cleansing, and it may be changed in color and form to satisfy the taste of the wearer. Its disadvantages are that it hampers the free movements of the body, its weight has to be constantly borne, and it is constantly absorbing from the body and from its surroundings excretions and contaminations of many kinds. Constant attention to the purification of clothing is therefore necessary to guard against disease. Primitive man clothed himself with the skins of animals slain by him, and savage races today use the same material in countries where any body covering is necessary, or where the ubiquitous merchant has not appeared with his shoddy goods and trinkets to trick the unwary savage into exchanging his peltries for the habiliments of civilization. As the race developed other materials were discovered which offered advantags over the skins of beasts for clothing. The most important of these were wool, linen, silk and cotton. Mankind found means to weave these substances into fabrics, and to dye them with numerous colors to please his slowly developing tastes and fancies. Hundreds, probably thousands of generations, wove and colored and fashioned these materials into forms of clothing and dress before Solomon, in all his glory, appeared and welcomed to his temple the Queen of Sheba. The contrast in attire between these two important personages and the gentleman and lady of our own times was quite marked. Solomon did not wear trousers, nor, probably, did the Queen of Sheba wear corsets. Loose robes, which swathed the body with very little adaptability to its form were beautiful perhaps to the eye, but decidedly inconvenient to the wearers. The toga of Cæsar and the stola of Cleopatra were not much improvement so far as comfort and ease of movement were concerned. Though the subject is one of great interest, yet we cannot take the time to trace the evolution of dress down to the present time. This evolution has, on the whole, been in the direction of both health and comfort, especially in male attire. There really seems little necessity for improvement in the dress of the ordinary business, professional, or laboring man of the period. Both his under and outer garments are cut to fit the body comfortably. The entire weight of nearly all the garments is usually suspended from the shoulders instead of from the hips, thus avoiding any constriction of the waist.

Though there is little to criticise in the present dress of civilized man, we find several things to criticise in the dress of civilized woman. They are not new things which belong to our day alone and which are likely to change for the better tomorrow. They are older than our grandmothers, and have been persistent through generation after generation of women whose judgment, perceptions and intuitions in other matters than dress are in many ways superior to those of their brothers.

The contrast between the dress of a man, cut to fit the form given him by nature, the weight borne upon the shoulders, and the trailing skirts of women, with their weight suspended from the hips, is not only striking, but it shows by contrast the great superiority of the dress adopted by man for comfort, health, and the free use of the limbs. But the long skirt is not the only evil in woman's attire, nor is it the greatest.

The unnatural contraction of the body through tight lacing has, perhaps, proved of more universal injury to women than any other one cause that can be named. Not only is this true, but it is an evil which women alone are, to a larger degree, responsible for than they are for the inconvenient skirt. In early days when men were really the lords of creation and women merely their vassals and slaves, men of every tribe and nation gradually discarded kilts and skirts and adopted a costume best adapted to their comfort and convenience, while they ruthlessly required their women to wear the skirt. Man will never regret his choice, while long habit and the importance of wearing a costume to indicate her sex has made the skirt acceptable to woman and such, we presume, notwithstanding its faults, it will long continue to be. Spasmodic attempts to induce woman to adopt some modification of the trousers in her attire, like the bloomer effort, have always failed and probably will continue to fail for many generations at least. But we do not believe that tight lacing is in any degree due to man's inhumanity to woman if the skirt is. This is something woman has herself adopted and appears to believe necessary to render her form most attractive. At least most women do, and they cling to their corsets as the oyster does to its shell, but without the disposition of the oyster to adapt the shell to the form of the body.

Much has been written by men and by some women upon the evils of tight lacing. The humorist and caricaturist have exhibited its absurdity, and the highest medical authorities have frequently shown its serious influence upon the health of women. So far as I know, no one has investigated this subject in so thoroughly a scientific manner as has Dr. J. H. Kellogg, of Battle Creek, Michigan. These investigations were detailed by Dr. Kellogg in a paper read by him some years ago before the State Medical Society of Michigan. The entire paper is both valuable and interesting, but I can take your time for only the briefest synopsis of his methods and results. The doctor first attacks the theory held, as he says, by all authorities in physiology that there are two distinct types of respiration in human beings characteristic of the two sexes, namely, abdominal and costal; men breathing chiefly with the lower portion of the chest, using the diaphragm and abdominal muscles freely, while women breathe chiefly with the upper part of the chest. He finds that in childhood the respiration of both sexes is the same, and that the change occurs simultaneously with the change of dress in the girl when she enters upon womanhood and begins some form of tight lacing. To prove that this difference in respiration is not a natural one due to sex, the doctor provided himself with a pneumograph and had made for him a recording cylinder, which he calls a kymographion, and started for the West to test this question upon some of the corsetless native women of the plains. Going to San Francisco first he there made tests of about twenty Chinese women. These women, however much they may disfigure their feet by tight lacing, leave the body free from all restriction of this kind. "In every one of these women abdominal breathing was as prominent as in males who lead sedentary lives," as shown by the tracings upon the instruments used.

Dr. Kellogg's next observations were made among the Yuma Indians, the most primitive tribe existing in the United States. The women of this tribe wear just as little clothing as possible and the men sometimes less. Above the hips and below the knees absolutely no clothing is worn. "Measurements taken of these women show the circumference of the waist to be, on an average, scarcely more than one and one-half inches less than that of the chest. A wide contrast to the corset compressed waist of the civilized woman." Tracings of respiration by his instruments showed the abdominal breathings of these women to be somewhat greater even than those of the Chinese women.

Tracings taken next of a number of Chickasaw women and men exhibit breathings practically identical of each sex. The doctor next turned his attention to the few civilized women he was able to meet who had either never worn corsets or who had discarded them. In every instance abdominal breathing like that of men was noted. Tests of lower animals show no difference between the sexes in this respect, thereby confirming the view that in civilized human beings the difference in breathing between the sexes is not a natural one, but one wholly due to artificial constriction of the abdomen in women. The most important part of Dr. Kellogg's investigations relate to the effect of tight lacing upon the abdominal viscera. These investigations were made by means of an instrument devised by him which he styles a mercurial dynamometer. By the use of this instrument he was enabled to discover "the amount of pressure to which the pelvic organs are normally subjected, and to which they are subjected by the wearing of the corset or the other constricting articles of dress." We have not time to show these results in detail as recorded by this ingenious instrument. It is sufficient for our present purpose to state that they represent changes of position and of pressure of all the pelvic organs "very considerable in degree, and of important pathological import." In this work of displacement and pressure the corset is greatly aided by the long, cumbrous and often heavy skirts. The influence of the two combined is such that the woman whose stomach, liver, spleen, intestines and other important pelvic organs are in normal condition and position is a rarity. A very large proportion of the numerous and well known pelvic diseases of women, it is asserted, are due to tight lacing and the long skirt.

But there is another indictment against the long skirt, perhaps even more serious from a hygienic standpoint than its cumbersomeness and weight. The charges against it we have been considering affect only the wearer, but the new charges affect the health and lives of the entire family of the wearer. The long skirt is a scavenger. But it is a scavenger which does not carry its gatherings to the compost heap. Instead, it brings them into homes where its vile accretions may be impartially and generously distributed. As a germ collector the ample folds of the skirt dragging along the street is very perfect in its work, and probably rarely fails of securing a good catch for its wearer. Many obscure outbreaks of communicable disease might, without doubt, be traced to this source. So far as I know wherever tests have been made of the material and dust found adhering to the bottom of skirts, pathogenic bacteria have been found. And why should they not be? When we reflect that the commonest and most fatal diseases, such as consumption, pneumonia, influenza, and diphtheria are spread by means of the sputa and nasal discharges of those having these diseases, many of whom are able to be upon the streets and are constantly contaminating sidewalks and other places with these discharges, it seems difficult to believe that the sweeping skirt can escape pollution.

Dr. Casagrandi, of Rome, stated that he had employed a number of women wearing long skirts to walk for one hour through the streets of the city, and after their promenade was over he had taken their skirts and submitted them to a careful bacteriological examination. He found on each skirt large colonies of noxious germs, including those of influenza, tuberculosis, typhoid fever, and tetanus, and numerous other bacilli which also were represented on each skirt.

Other peculiarities of female dress manifestly unhygienic we have no time to consider, only naming for its manifest unhealthfulness and frequent cause of serious illness the misnomer in attire styled full dress. A woman, made delicate perhaps by the corset and the long skirt, arraying herself on a cold night for a reception or the ball room, with bare neck and arms and with feet encased in the thinnest of shoes, tottering upon heels placed near the middle of the foot, is a sight which should make a very ordinary angel weep and one of the better class indignant.

Why do women adhere so persistently to methods of dress so manifestly inconvenient, unhealthful, and unhygienic? Few of them, we believe, can plead entire ignorance of the evils we have noted. We know of some who claim that their grandmothers dressed in most respects as do the women of the present generation, and were healthful. Perhaps so, but most of these grandmothers lived lives of healthful exercise in scrubbing floors and in other household duties and out-of-door work, which the present generation knows but little about. The lady of today has comparatively little of this kind of exercise and consequently spends less time in healthy dishabille. Today two classes of women are especially affected by the trammels of fashion in dress. First, the class whose household duties are performed by servants; and second, the class, the members of which earn their own living. The first class spends a large part of the time uncomfortably and unhealthfully in several daily changes of attire, each change including the long skirt and tight lacing, and involving variations in warmth of clothing and at times of exposure of the person to the cold. A woman must possess unusual strength and vitality who can live this kind of life without serious detriment to her health. In point of fact, as is well known, few do; and it is, therefore, this class who furnish so large a proportion of the physician's fees, especially in our large cities. The second class, the wage earners, have been rapidly taking the places of men during the last few years in stores, in offices, and in factories. The tendency to do this would increase much more rapidly could the women desirous of entering these and other pursuits in competition with their brothers, break away from the slavery of dress. To some extent they have done so, for most of them have donned the short skirt from absolute necessity, and this has had its influence in creating some degree of popularity for this garment for street wear. Will they, after a time, learn how they are handicapped in their struggle for securing positions in many occupations now filled largely or exclusively by men by the trammels of dress in the other ways we have been considering? It is to this class of women, we believe, more than any other that we may look for any attempt to change, or at least to modify the present style of woman's dress to one of greater comfort for herself, and of healthfulness not only for herself, but for the children she may bear and rear and for all others whose health and happiness depends upon her physical condition.

From very early times civilized woman has been regarded as unequal to man in physical strength. That she is so today is undeniably true. What is the reason for this? The females of all the lower animals and of all the lower races of man are equal in strength to the males. Even the peasant women of continental Europe do as efficient work in the fields as man. This difference, therefore, in the strength between civilized man and civilized woman is not a natural one but is entirely due to the effects of civilization in the development of the sexes in different directions. The direction of man has been toward the practical, while that of woman has been toward the attractive. Here again the order of nature is reversed, for in all the lower animals it is the male which is the representative of beauty, while the female performs the homely duties of rearing and providing for the family. All down through the ages of which we have records it is the woman whose æsthetic taste has furnished the attractions of the home for her lord, her master, and in our day her husband. Chief among these attractions has been herself, and the desire to render herself most becoming has, through the process of evolution, been increasingly effective in making such desire one of the strongest characteristics of her sex. She is conscious that her efforts in this direction are successful, and that she is admired by man in some degree, at least, in proportion to her success in increasing or developing her natural charms by dress. To seek to dispossess woman of this characteristic now inherent in her nature would be impossible even if desirable, and I don't know of many who would consider it desirable. But we do believe it possible by keeping continually before men and women the unhygienic effect of woman's attire, to bring about modifications of great advantage without any radical change in its form. We do not believe that the unnaturally contracted waist is more attractive to the majority of people than the natural waist, nor do we believe that more people will admire a street sweeping dress than they do a dress that clears the ground when worn. But if they do, what matters? Health is of paramount importance, and I am loathe to believe that when women are really convinced that the dresses they wear are a menace to the health of themselves and their families, they will refuse to make such changes as modern knowledge decrees to be necessary. Those women are our wives, our mothers, our sisters and our daughters. We love them for the possession of many virtues in which man is deficient. Among these virtues is the spirit of sacrifice. Once let them realize that something of their ideas of personal beauty in dress must be sacrificed by them in the interests of their own, their family's, and the public health, and they will be quick to respond. In this as in all other conditions which menace the health of the people, education must be relied upon as the chief remedy. If the evils pointed out in this report are as great as the writer believes them to be, this Association should surely place reform in dress among the efforts it is making to improve the public health.

SOCIAL HYGIENE.

By Dr. ADOLFO OLIVA, Guadalajara, Mexico.

DRESS.

The direct relations between the outside medium and the cutaneous surface, are liable to bring about disagreeable consequences on the human system, that in some cases may be injurious to health. For this reason, and desiring to shield himself from the sudden changes in the atmosphere, man commenced by constructing his dwellings, and later on supplied himself with a dress.

The variations of the temperature of the system with the climate, seasons, age, constitution and the conditions of health or of disease, fully demonstrate the physiological necessity of dress.

Nature has provided the animals with special covering that will protect them against the variations of temperature. In the mamifera, for example, the protecting covering is thick in winter, in consequence of the fine and abundant hairs that are formed in the interstices between the older hair. But man, whose organization is not adapted to those outside influences, has brought his intellectual activity to bear, in order to prevent the suffering that would result from want of adaptation.

As is so justly said by Levy, the dress is another tegument, which in the civilized world forms an inherent part of the individual, and its study, from a practical point of view, pertains to the hygienic branch.

As is well known, the purpose of dress is to protect the system against the rain, snow, solar rays, the winds, as well as to avoid the bruises that might be caused by exterior forces. It is important that it should neither present any obstacle to muscular action, nor to the regular working of the different organs of the system, and especially to the working of the circulatory and respiratory organs. On the other hand, the skin throws off carbonic gas and perspiration, which it is important should find an outlet, and for this reason the dress should not, under any circumstances, form an obstacle to the cutaneous functions.

In general terms, we may say that the dress should be adapted to the season, warm without causing oppressive heat, and made in such a manner as to permit of the free discharge of the heat and the evaporation of the perspiration from the skin.

NATURE AND PROPERTIES OF THE TISSUE WHICH GO INTO THE MAKING OF A DRESS.

The raw materials that are employed in the making of a dress, are of a vegetable or animal nature. These materials, either isolated or mixed with each other, are used in the manufacture of the tissues that are intended to cover the human body.

The vegetable substances are flax, hemp, cotton, rubber, jute, phormium tenax, straw, etc.

Flax, especially that cultivated in the north of Europe, is made up of cylindrical filiments, which are smooth and at certain distances present single or double transverse lines; are soft to the touch, white, yellowish or gray. A ten percent solution of soda or potash causes no change in the fibre of the flax, which is softened or entirely dissolved in an ammoniacal solution of copper. When properly prepared, flax furnishes extremely delicate threads that are employed in the weaving of the finest tissues.

Hemp, which is at present cultivated in many parts of the globe, originally comes from India and Persia. Its fibres are not so smooth, soft or white as those of flax, but they are both stronger and more durable. They are insoluble in the solutions of hydrates of potash and of sodium, above referred to.

Cotton is nothing more than the fur which covers the surface of the fruit of the *Gossypium*. It is a native of America and of India. By the help of the microscope, we find that its fibres consist of plates twisted one over the other in spiral form, that they have a granulated surface and slightly undulating edges. They will dissolve in an ammoniacal solution of copper and undergo no alteration when treated with hydrates of potash and sodium. In the course of trade, cotton is found with long filaments and also with short filaments, the former being preferred on acount of its greater fineness and elasticity.

Rubber, which is a gum extracted almost entirely from the *Siphonia cauchu*, is a native of America. It is employed in combination with sulphur to make vulcanized rubber, because, in its natural condition, or dissolved in benzine, it is very adhesive, is softened by heat and very soon deteriorates with use.

Jute, which is also called Indian hemp, finds an ever increasing use in various industries. Its fibres are insoluble in ten percent solution of hydrates of sodium and potash.

The *Phormium tenax*, or New Zealand flax, is made up of fibre with a color very similar to that of hemp, but they are softer and more flexible. These fibres do not undergo any alteration in the alkaline solutions above mentioned.

The fibres of Manila hemp are insoluble in potash and sodium, and are used, especially in the Philippine Islands and in China, in substitution of flax and hemp.

The use of the straw of certain grass-like plants, in hats, footwear, etc., is relatively limited. Ten percent alkaline solutions have no effect on straw fibres.

The fineness of flax makes it admirably adapted to the manufacture of the most delicate tissues.

Hemp is used more especially in the manufacture of tow and ropes. Its fibres become of a pale yellow color, under the influence of azotic acid.

At present, cotton is most generally used. It is not so warm as flax or hemp; the roughness of cotton textures is disagreeable to persons affected with skin diseases; but, outside of these particular cases, it serves very well for those parts of dress intended to cover the external tegument. Cotton contains less moisture and is not as cold as linen, and when damp produces a disagreeable sensation on the skin. To these advantages we may add another which is not to be despised, and which consists in its low price.

Cotton is not only employed in the manufacture of underclothing but also in articles of outside dress, and especially by our poorer classes. Amongst the cotton tissues, there is one that is specially dangerous. I refer to that kind of cloth in which the outside surface is covered by long silky hairs that, on contact with a flame, will burn like pyroxiline. The use of this cloth, which is very general on account of its low price, has given rise to a great number of serious accidents.

Rubner and other learned men have demonstrated by means of the microscope, that all the different species of tissues are made up of fibres that run in different directions so as to form a net, the meshes of which enclose spaces of different dimensions, which are open to the air.

The properties of the tissues bear a relative proportion to the air and to solid matter, rather than to the nature of the raw material.

SUBSTANCES OF ANIMAL ORIGIN.

Such are wool, goat's hair, fur, skins, feathers and silk.

Wool, which consists of sheep's hair, is made up of filaments of more or less length, which are fine and flexible, with serrated edges and containing a duct in the central part. They dissolve with comparative facility in ten percent solution of hydrates of sodium and potash, slowly soften in an ammoniacal solution of copper, and the fibres take a dark brown color in plumbate of sodium.

The fineness of the wool is in inverse ratio to the length of the staple. Goat's hair is utilized in the manufacture of cashmere, a soft and flexible cloth that is adapted to the making of dresses for spring use.

The fine hair of certain rodents is employed to protect the system against the excessive cold.

Birds' feathers are used to make bed clothing and in the way of ornament.

Silk, which is so much used in the manufacture of different tissues, is the well known product of the silk worm. The silk fibre is composed of two filaments that are easily isolated, and that appear in the form of a delicate transparent ribbon with longitudinal striations. It will dissolve in a ten percent solution of potash and soda, and is not attacked by the ammoniacal solution of copper. Robinet has demonstrated by many experiments that the finest silk is also the strongest.

EFFECTS OF DRESS ON THE SYSTEM.

Permeability. The air contained in the tissues themselves is in constant movement, caused by the differences of temperature between themselves and the surrounding atmosphere, as well as through the changes of pressure caused by the currents of air and the movement of the body which is covered by those tissues.

By virtue of this mobility of the air contained in the meshes of the tissues, gaseous changes take place which allow the surrounding atmosphere insensibly to penetrate to the surface of the skin, thus securing its satisfactory action.

It is well known that amongst other products, the skin throws off carbonic gas. It is evident that if this gas was indefinitely accumulated in the tissues that form the dress, its eventual elimination would be found very difficult, and the health of the individual would suffer; but this is not observed, for the reason that the permeability of the tissue allows a constant change to go on between the outside atmosphere and the carbonic gas which is thrown off by the outside tegument. It is important to observe here, that the permeability of the tissues with respect to the atmosphere, is a condition that notably favors the evaporation of the perspiration.

Texture. As the air is a gas that forms a bad conductor of heat, it will be understood that a cloth will appear warm in proportion to the volume of air contained in its meshes. It is for this reason that thick cloths with wide meshes are warmest, more so than the thin cloth with narrow meshes.

The texture of the dress also exercises an influence on the sensitiveness of the skin. The cloths with a rough surface, hairs of different animals, and especially of the sheep, are apt to irritate the skin and even sometimes to cause a disagreeable heat, itching and other skin diseases.

From the point of view of the irritation which is induced by the dress, we can establish the following descending order: woolen, cotton, hemp, linen and silk cloth.

Absorption of Moisture. The dresses retain the humidity of the surrounding atmosphere on their surface and in their pores. Generally speaking, those textile substances which are most absorbent are cool and expose the body more to the action of a damp cold and its consequences. From the point of view of humidity, they can be classified in descending order as follows: Linen, hemp, cotton.

The water that impregnates the dress can be divided into two parts, according to the opinion of Coulier, the absorbed water that remains in the tissues without being perceived by the touch, and that which can be expelled by pressure. The quantity of this water varies according to the nature of the tissues; cotton absorbs more than hemp or linen. The other part of the water absorbed by the tissues and called "interposed water," and which is retained by capilliary action, is perceived by the touch and can be expelled by strong pressure. Wool absorbes a greater volume of interposed water, which is slowly and gradually eliminated when the body perspires, without occasioning any sudden chill.

The tissues are also impregnated by organic and inorganic substances as well as microscopic insects, that may well be the agents of infecto-contagious disease. From this fact, which has been proved by the investigations of scientific men, we can infer the absolute necessity of frequently and properly cleaning all the articles of clothing, but more especially those that come into direct contact with the skin.

Heating Properties. The principal object of the dress is to protect the human body against cold, or in other words, to preserve the calorics which the body constantly produces, thus maintaining its own temperature, independently of the surrounding atmosphere.

Like all other bodies in the universe, the human system is subject to the laws of thermic radiation, that is to say, that it throws off heat by radiation from all parts of its surface, in proportion to the area and temperature of that surface. The result is that a naked man in the winter season reaches such a high degree of radiation that within a very short time, the cold in his body becomes incompatible with life.

The outside clothing is in general a poor conductor of heat, and its surface, therefore, throws off less heat than that which it receives on its inner surface from the skin. In this sense, the dress may be compared to a shield placed between the skin and the surrounding atmosphere.

On the other hand, as the air possesses a very low conductability, about 100 times less than that of the raw material employed in the manufacture of the cloth, we may logically assert that the air contained in the meshes of such cloth, efficiently contributes to reduce the loss of heat by radiation. In fact, it is observed that the wool which encloses the largest proportion of air between its fibres is the warmest. In this concrete case, the air contained in the tissue is warmed by contact with the skin and keeps the body in an agreeable atmosphere.

When the tissues become saturated with absorbed water, their capacity as conductors of heat is appreciably increased, and this is easily explained if we take into account that the conductability of water is superior to that of the air, which is substituted by that liquid. The increase of conductability is in proportion to the volume of water absorbed, so that wool saturated with water increases its conducting power to 109%, silk and cotton to 40 and 29.9% respectively.

The superimposed clothing is warmer than a single article of the same thickness, because between the different articles several layers of air exist, whose conductive power is represented by one. The floating articles of dress give less protection because they permit a rapid renewal of the air, which therefore cannot be warmed up.

Influence of Colors. The emitting and absorbing power of the tissues, also varies with their color. Nevertheless, speaking of the absorption of heat, Bache and Coulier have noted that the differences can only be appreciated during exposition to the solar rays and not to heat in the dark. The following is the classification of the colors, commencing with black, that absorbs most heat: Dark blue, light blue, green, purple, scarlet, yellow and white.

Krieger and Pettenkofer experimentally demonstrated, that, assuming the luminous heat absorbed by a white cloth at 100, a dark yellow cloth will absorb 140, a scarlet 168, a brown or dark blue 198, and a black 208. (Arnould).

In view of these facts, hygiene teaches us to use in winter time tissues that are bad conductors of heat and of a dark color, and for the summer, clothing made out of good conducting cloth and of a light color.

Certain coloring matters are poisonous and capable of producing lesions on the skin with which they come in contact, and even general symptoms of poison. Amongst these toxic substances are arsenical compounds, oxide of antimony, tartrate of antimony and potash which are employed as mordants; aniline, coraline and chromate of lead, which are sometimes used to dye the tissues that are intended for the manufacture of clothing.

Electricity. According to Levy, silk, wool, feathers, and furs have the property of developing and retaining the electric fluid. Cotton, hemp, and linen are good conductors of electricity, and it is in view of these properties that persons who are afraid of electric discharges, cover themselves with silk cloth during a storm.

Light. The vivifying influence of light on the exposed parts of the body is well known. Its attenuating action on pathogenic bacteria has now been fully demonstrated, and it is therefore to be assumed that the rays of light which pass through the tissues, exercise a beneficent action on the functions of the skin, and in some cases prevent the disastrous effects of parasitical bacteria by attenuating their virulence.

EFFECTS OF DRESS ON THE SYSTEM, AND FORM OF THE DRESS.

As we have already seen, the thickness of the dress, or rather the number of tissues of which it is composed, notably decreases the loss of caloric from the system whenever the surrounding atmosphere has a temperature that is perceptibly lower than that of the skin. In this manner, the dress allows us to avoid the exaggerated consumption of heat producing food, and can be considered as an artificial regulator of the physiological temperature. The dress prevents the skin suffering any sudden chill that could give rise to a congestion of the viscera, but on the contrary produces an agreeable feeling of warmth.

The dress is also necessary whenever the outside temperature is very high. In this case, it protects the skin against the action of a strong heat and prevents the injurious chills that are caused by the strong currents of the atmosphere. The body being covered, the temperature on the surface descends and the skin maintains itself at the same degree of warmth.

Humidity modifies the thermic action of the dress. Instead of reducing the loss of caloric from the body, as happens with a dry dress, the damp tissues considerably increase those losses and thus predispose the system to a chill. Moreover, the water that occupies the pores in the tissues, prevents the free circulation of air, whose renewal is indispensable for the evaporation of the sweat, sometimes causing the reabsorbing of the excrementitious principles of the skin. The water and sweat that are accumulated in the dress increase its weight, and thus impede the execution of the different movements of the body. It is to be observed that the water which impregnates the tissues is eliminated by evaporation, and that process works more rapidly in linen and cotton than in wool.

Damp woolen tissues do not appreciably cool the skin, retain the organic and mineral substances that are dissolved in the sweat in a smaller proportion than linen and cotton, and consequently remain clean for a longer period.

The impermeable tissues which are made of rubber, are undoubtedly well adapted to prevent the penetration of damp, but are objectionable because they are also impermeable to the atmosphere. For this reason, they prevent the ventilation of the subjacent tissues and of the skin, which are very soon bathed in perspiration, however little the temperature may be raised by the surrounding heat or under the influence of muscular labor, and when the outside temperature is low, these tissues allow of the loss of a great number of calorics by conduction.

From the above remarks, it will be understood why hygienists consider impermeable articles of dress as only necessary in the event of rain, and always require them to be taken off immediately after.

It is certainly very difficult to form invariable rules as to the style of dress, because these vary with climate, national customs, age, social position and resources of the individual.

Notwithstanding these difficulties, we can say in general terms that the dress should be comfortable and easy, so as to facilitate the physiological acts of the system. An easy fit favors the changes which are effected between the external tegument and the surrounding atmosphere, because it permits a soft and constant ventilation. But it is also to be noted that articles of dress which are very loose, are only required in hot climates.

Dr. Rochard notes that modern nations prefer to have their clothing kept close to the body by means of belts, neckties, tight collars, garters, etc. All of these articles are ligatures that impede the capillary and venous circulation, disturb the circulatory and respiratory functions when applied to the base of the thorax, as in the case of a corset, and may even cause a dislodgement of the viscera and displacement of the vertebral column.

·Hygiene does not exclude good taste, seeing that it furnishes us with rules, that preserving the beauty of the body, also secure its health.

Women would do well to abandon those low necked dresses that they wear in balls, theatres, etc., for the reason that they thus uncover certain regions of the thorax that cannot be exposed to the cold without danger.

The different articles of dress should be made in such a form as to adapt themselves properly to the different parts of the body for which they are intended. It is desirable that they should protect certain regions that are especially sensitive to the variations of temperature; as for example, the abdomen, which should be covered by the lower part of the same article of clothing that covers the breast and by the upper part of that which covers the lower members.

Light dress is especially desirable during violent exercise, as the excessive wrapping of the body in executing this kind of work, renders it more liable to chills.

The clothing of recently born children should be sufficiently warm, but without any asperity or seams that might hurt the delicate skin at that age. It is likewise well to avoid placing flannel in contact with the skin, because that tissue is easily impregnated by the cutaneous emanations and weakens the child through the constant perspiration which it produces. The contrary is the case with old people, in whom flannel, cotton and wool stimulate the skin and give energy to the functions of nutrition, which are already debilitated by age. (Kuborn.)

Warm clothing is also desirable for weak, convalescent and lymphatic persons, as well as those who show a predisposition to affections of the lungs. Those persons who are of a nervous and irritable temperament, should especially use light and moderately warm clothing.

RELATION OF THE DRESS TO THE DIFFERENT PARTS OF THE BODY.

The Head. This member, which is naturally protected by the hair, does not indispensably require any artificial cover. The ancient Romans and Greeks only covered their heads while traveling, and according to Ferry, hats were introduced in France in the time of Charles VIII. Since that time, the custom has been abused by the use of thick caps, wide brims, etc., until the end of the eighteenth century. (Rochard.)

At present, the head is frequently uncovered and remains so during sleep, and hats are generally made as light as possible.

As regards children in infancy, thick caps are not advisable because they increase the heat of the head, excite the morbous secretions of the scalp and predispose the child to congestion of the brain. Care ought also to be taken not to compress the heads of children too much so as to avoid the deformation of the cranium, which may ultimately bring about serious consequences. From the second stage of infancy, it is well to accustom the children to go bare headed, except in those cases in which, through the ordinary necessities of life, they have to remain exposed to the sun's rays, and in such cases, they should only use light caps or straw hats.

For the use of adults, preference ought to be given to broad brimmed hats which will protect the head, face and neck from the action of the solar rays, made of tissues which allow the passage of air, so as to secure the constant renewal of the vitiated air that accumulates between the scalp and the upper part of the hat.

The permeability of the tissues prevents the exaggerated increase of temperature in the vacant space inside of the hat. Hats which are manufactured out of paper and silk cloth, so that they are impermeable, ought to be avoided from a hygienic point of view. They are heavy, do not preserve the head from either heat, the cold or the rain, and predispose the person to baldness.

In order to secure the renewal of the air, it is desirable to make two openings on opposite sides of the crown, an arrangement that is always useful; but especially necessary when dealing with impermeable hats.

The temperature of the air contained in the inside of a hat is perceptibly modified by the ventilating openings and by the material of which it is constructed. In order to prove this fact, I will cite some observations which are found in the learned work of Dr. Langlois. This author says:

"In four individuals who went over the same number of streets, under identical conditions in the month of July, the following temperatures were noted in the interior of the hat:

High-crowned black hat	46°
Naval officer's helmet	41°
Sub-officer's helmet, with ventilators	37°
Colonial white helmet	33°

Showing a difference of 13 degrees."

For both adults and children, straw and cotton hats are to be preferred over those made of beaver or rabbit fur. The latter can, nevertheless, be used, provided that the hygienic rules above given are observed.

As far as regards the head covering of the women, there is nothing to object to, from a hygienic point of view.

To bring this point to a close, I can do no less than protest, in the name of science, against the use of the so-called "Charro hats" of my own country. They are almost all manufactured out of rabbit fur, and overloaded with ornaments of silk, silver and gold, and therefore are even more objectionable than the common high-crowned hat.

Collars. When in good health, it is well to leave the neck uncovered, especially with children, so as to accustom them to the weather and render them less susceptible to inflammation of the larynx and throat in general.

The neck, which is full of main arteries and veins, cannot be squeezed without danger of preventing the return of the venous blood from the brain to the heart, thus causing epistaxis, cephlalgy, vertigo and apoplexy.

The high and rigid shirt collars are apt to produce horny surfaces, eruptions, ulcerations, cervical adenitis and widening of the lower jaw. (Polier.)

Neckties should be made of white, soft, elastic tissues, without the addition of cardboard, horsehair or metallic plates. Thick, hard and tight cravats are apt to bring on a sanguineous extasis in the lungs and brain.

Trunk. The form of the articles of clothing which are intended to cover the trunk of the body, vary according to conditions of climate. The atmospheric conditions which are observed in our continent require the dress to be applied directly to the body.

The shirt is the principal article of underclothing, and is made of cotton, linen and hemp, the first being the one most commonly used. It is desirable that this article should not be very thick, as it predisposes to affections of the skin, nor too thin, because it would not sufficiently absorb the products of the cutaneous secretions. It is to be recommended that the collar and sleeve openings should be large, so as not to interfere with the circulation in the neck or the movement of the arms. It is very desirable to change the shirt, as well as other articles of underclothing, with great frequency, and when this is not possible, to have one shirt for the day and another for the night. In this manner, the one which is taken off has time to dry and to throw off in part the excrementitious principles which it has absorbed during use.

Besides the ordinary shirt, persons of means often wear a flannel undershirt. It is necessary to prevent children from adopting this custom, except in special cases of debility or of a strong predisposition to affections of the respiratory organs.

The outside articles of clothing which cover the body, such as the coat, jacket, etc., and which also are intended to protect the lumbar region and upper members, should be easy and comfortable. In order to make them perfectly hygienic, they should not in any way press on the lower part of the neck or of the chest.

The lower part of the trunk, or abdomen, is protected by the shirt, drawers, trousers and waistcoat. Hygiene requires that all these articles should be arranged in such a manner as to keep the abdomen warm without exercising such a pressure as to disturb the action of the organs therein contained. For the same reason, hard and rigid leather belts are prohibited, which may also bring about the atrophy of the muscles. If belts are used, they ought to be wide, elastic and press equally on the abdomen and lumbar region.

The dress of women does not present any special subject for development, and what has been said thus far, will apply to that. The only article of feminine dress that is of interest to hygiene, is the corset. It is not an article of modern invention and the Roman and Greek women supported their breasts by broad bands that went round their bodies, but the present form of corset was first introduced into France in the XVI century by Catalina de Médici. (Rochard.)

The corset which is made of cloth with flexible whalebone fittings, and intended to support the thorax and prevent "xiphosis," is not anti-hygienic.

On the other hand, considering the form of feminine dress, the corset is useful to the woman in order to attenuate the pressure exercised by the bands that hold the skirts to the figure. Without the corset, these bands would leave a deep furrow in their place, and would cause real suffering whenever it was attempted to securely fasten the skirts.

Unfortunatly, many women show an inexplicable tendency to convert this support into an instrument of pressure and torture. For this purpose, they demand of the trade those cuirass-corsets which are formed of inflexible tissues and almost rigid metallic plates, undoubtedly ignoring that the application of these articles is reserved for orthopedics, when it is desired to correct certain malformations through weakness. The real purpose for which women abuse the corset is to create an artificial shape, such as does not exist, and attenuate the supposed defects of the one which does exist; but, in order to reach this result, they expose themselves to injury of different kind, and even to death.

The use of the corset (and I here wish to state that I refer to the use of the cuirass-corset, tightened to an exaggerated degree), interferes with the contraction of the dorsal muscles, atrophies the muscles of the fore part of the bust and decreases the tenacity of the abdominal wall. Besides this, in young women the constant pressure on the breasts prevents the complete development of the glands, and materially prevents their service in lactancy.

The pressure on the thorax prevents all play of the false ribs and does not allow them to open out in response to the respiratory movement. Under these conditions, the woman only has available the upper part of the lungs, and thus opens the door to tuberculosis and other pulmonary affections.

The difficult venous circulation obliges the left heart to execute abnormal efforts in order to produce the cardiac expansion, and whenever there is any hypertrophy of the heart, the corset aggravates the symptoms. Moreover, I have observed in my practice, the transposition of the central organ of circulation, as a consequence of the abuse of the corset. Pressing on the stomach, it lowers it in position, alters its direction and produces an expansion near the pylorus and a compression of the large tube. These modifications of the organs are interpreted by the symptoms that pertain to the gastric dilation.

The pressure on the intestines impedes their movement, renders the intestinal digestion difficult and predisposes to habitual costiveness. It has also been observed that the abnormal pressure on the liver by the corset forces it downwards, and that the bile is not segregated in the necessary quantities, or is wanting in physiological properties. Moreover, statistics show cases of sclerosis of the liver in women who make an immoderate use of the corset.

The spleen, which is charged with the very important function of producing "ematies," finds itself prevented from acting by the excessive pressure, and it should easily be understood that if this organ cannot work with proper regularity, the entire system is in imminent danger of being invaded by anemia.

It has also been observed that the floating kidney is more frequently found amongst women who use tight corsets.

The corset is unquestionably the cause of a multitude of uterine disorders, especially at the time of the monthly congestion and during gestation. The most distinguished obstetricians, amongst others, Tarnier and Pinard, consider it a frequent cause of abortion. Some authors condemn even the use of the so-called gestation corset. I would call attention to the fact that all the dangerous effects of the corset, as studied up to the present, are still more dangerous when the woman has abused its use from an early age. This case is very frequently found, as girls resort to it early on the pretext of supporting the vertebral column and giving them an erect carriage.

Upper and Lower Members. The upper members are protected by the sleeves of the clothes that cover the thorax. It is important to take care that these sleeves should be sufficiently wide, so as to permit the free circulation of the blood.

The drawers absorb, like the shirt, the products of cutaneous secretions of the lower members. They are almost always made of cotton, linen or woolen tissues, and protect the lower members against the asperity and dirt of the trousers, which are seldom washed. The upper part of the drawers is superimposed on the lower part of the shirt, and thus contributes to keep the abdomen warm. It is necessary to avoid the pressure on the abdomen in fastening the drawers.

Many women have adopted the very good custom of always using the articles of clothing I refer to. For the woman who uses loose skirts, the drawers have the advantage of preventing the currents of cold air striking the skin of the lower members and of the pelvis.

The long trousers have taken the place of the short ones that only covered the abdomen and thighs. The principal objection to the knee breeches was that, as they were tied at the knee, they prevented the circulation in the legs, besides causing varicose ulcerations and veins that were difficult to cure. For this reason, the long trousers that are now used, are more hygienic, always provided that they cover the abdomen without any pressure. For this purpose the trousers are supported without any effort, by elastic suspenders which pass over the shoulders without being felt.

In order that the trousers may fulfill their object, they will not be so wide as not to secure the abdomen and lower members from the outside cold; nor so narrow as to interefere with the abdominal respiration and circulation, besides predisposing the individual to congestion. Neither will they rise too high on the chest, so as to press the lower part of it and disturb the abdominal organs.

The legs are also protected by the stockings, which are held up by means of garters, and ought to be made of soft tissues that do not irritate the skin, besides making a good and easy fit on the leg. Stockings of cotton, linen, hemp, wool and silk should be used according to the season. Whatever may be the nature of the raw material employed, it is necessary that it should not be dyed with any toxic substance, such as arsenic, antimony, lead, etc., which might produce affections of the skin, or even general symptoms of poison.

The pressure exercised by inelastic garters, impedes the venous circulation in the legs, and may give rise to varicose dilation of the veins with all its consequences. In order to avoid these objections, it is advisable to make use of elastic garters, moderately adjusted, and placed above the knee, that is to say, at a point where the veins being deep under the skin, are protected from pressure. It is even preferable to use elastic suspenders in place of garters.

Extremities. The dress of the upper extremities is only required by persons who live in cold countries. The gloves, which are intended to protect the hands against the cold and its consequences, are made of silk, linen, hemp, cotton, wool, and frequently of skin, which gives good protection and is softer and stronger.

It is to be noted that the constant use of gloves makes the skin of the hands so sensitive that a touch is transformed into a sensation of pain.

Shoes are intended to protect the feet against outside violence, cold and damp, and also to support the weight of the body. Strictly speaking, the skin of the foot could serve as a sole, as can be seen in savage people and the poor of all countries. Nevertheless, civilization has introduced the use of foot gear, and our ways of living make it indispensable.

Dealing with foot gear, in the strict sense of the word, we may say that no fashion has changed so much in all countries as in this article, and that no part of the body has suffered so much torture. The form and nature of the foot gear varies according to the country, the professions and customs. They are manufactured out of woolen, cotton, linen and hemp tissues, but more generally out of tanned skins. The leather lends itself to all the forms that have been adopted by shoemakers. It is very much to be regretted that the shoe makers have for a long time insisted in ignoring the natural form of the foot, and in making the shoes according to an imaginary model. From this ignorant blindness, have resulted many disorders that are now seen in the malformation and other affections of the lower extremities. The short length of the shoe produces, during a journey, a descent in the arch of the foot and a malformation of the instep. When too narrow, too wide, or made of hard leather, they produce a painful hardening of the skin. The pointed toe of the shoe causes a displacement of the toes, which are mounted one on the other; the nails penetrate the soft tissues, and lastly, all these modifications finish by causing a change of relations in the tendons through which the foot is moved, and thus altering its functions.

The high-heeled shoe or boot disturbs the equilibrium, requires constant effort and facilitates falls, sprains and fractures. Moreover, the forced tension debilitates the articulation of the ankle and is very liable to produce a disturbance of the muscles of the feet. The fair sex, having understood these facts, has almost entirely renounced the use of those heels with a height of six to seven centimetres, obliquely placed below and forward, so that they convert the sole of the boot into an inclined plane, on which the foot would inevitably slide. Hygienists, who were very properly interested in this question, which is of such great importance to health, worked incessantly to convince the shoe makers to take inspiration from the anatomy and physiology of the foot. It is for this reason, that taking into consideration the natural symmetry of this organ, shoes are made in a more rational manner, and so avoid the evils I have above mentioned.

The sole of the model shoe presents a forward edge that is perpendicular to the central line of the foot and is symetrical in its inside and outside edge; but as the shoe so built is not very tasteful to the eye, I believe with Laveran, Arnould and other hygienists, that there is no great objection in allowing the shoe to have a rounded toe, always provided that the sole is exactly adapted to the form of the foot. Another indispensable condition is that the upper face of the sole should have a depression in which to receive the ball of the foot, and another for the heel. The rest of the face of the sole must be level.

For the reasons above given, the heel should be low and wide, and the upper part of the shoe should be hollow and closed at will by means of laces. This arrangement will allow the blood to circulate freely through the veins.

And finally, it is recommended that all the seams in the shoe should be outside, so as to avoid painful friction, callous formations and ulcerations.

REPORT OF COMMITTEE ON THE CONTROL OF MILK SUPPLIES IN LARGE CITIES.

By Dr. WILLIAM H. PARK, Chairman, New York City.

The regulations formulated to safeguard the milk supply of large cities must be directed to secure —

1. Proper conditions at the farm.
2. Proper conditions during transportation.
3. Proper conditions at the delivery stations and proper care of the milk at homes.

Until recently the conditions at the farms have been largely overlooked by the health officers of great cities on account of the practical difficulties and the expense. During the past year, however, much more attention has been given to this portion of the work and your committee believe that the time has come when bad conditions at the farms and creameries should be no longer tolerated. On account of the expense of inspection supervision must probably be, for a time, largely indirect. It is through the large dealers that pressure can be best exerted. As an illustration of the tendency to increase the amount of supervision the example of New York may be cited.

The Department of Health of New York City has just issued circulars which must within a reasonable time be attached to every barn and creamery. These contain certain regulations which must be carried out if the milk is to be sold in New York. They also contain recommendations which the farmer need not attend to, but which will at least bring to his mind the best methods.

These circulars are appended to this report. Permits to sell milk in the future will only be allowed to those who allow of inspection, so that even without the state giving the right no farmer will dare refuse inspection by the city representatives.

In spite of laboratory examinations we consider that conditions at the farm can only be properly learned through inspection and the city or state should endeavor to employ enough inspectors to visit each farm at least once during the year. Far fewer inspections, however, if the visits are made at unexpected times or when a complaint is received, will do great good, create a wholesome fear among the slack, especially, if severe penalties are inflicted, such as revoking the license, when grossly improper conditions are discovered.

It is generally considered by bacteriologists that the most serious contamination of milk is the addition of the contagion of scarlet fever, typhoid fever or diphtheria. Tuberculosis is also liable to be carried by milk. Of less though of considerable importance is infection with the bacteria derived from diseased cattle, such as those suffering from inflamed milk ducts, diarrhoæa or sepsis. The ordinary bacteria of milk which are derived from the cow manure, hay dust and other sources are even less harmful and only render milk distinctly dangerous to infants, when in considerable numbers, and even then chiefly because of the chemical changes they produce.

The city should insist absolutely that the officer in charge of milk inspection should be notified when a case of suspected typhoid fever, scarlet fever, or diphtheria occurs on a farm supplying milk, and that no person coming in contact with such cases should have anything to do with milking or bottling the milk.

It should also demand that the water used in the milking room and barn be above suspicion. A decently clean condition of the barns, cows, milkers and dairy rooms should be required.

The question as to whether tuberculous cattle should be allowed to supply milk to cities is one of great importance, and is also a very difficult one to answer. There is now no doubt that bovine tuberculosis is transmitted to children. It is extremely probable, however, that the percentage of tubercular children infected in this way is rather small. Cattle having appreciable tuberculosis of the udders are the most dangerous, and those having pulmonary tuberculosis the next. There can be no doubt that such cattle should be destroyed, both because of their danger to children and perhaps adults, and also because of their danger to other cattle. The majority of farmers would agree to this. The difficulty is to decide what is to be done about cattle which have very slight tubercular lesions, which can only be detected through the tuberculin reaction or autopsy. At present 20-30 percent of cows have such tuberculosis. Probably more than half never develop appreciable lesions. The farmer strenuously objects to having them killed, and has succeeded at present in impressing his opinions on others, so that at present almost no restriction is placed upon the sale of milk from tuberculous cows.

For the sake of the cattle as well as the men this is not a desirable condition. The health authorities in cities should definitely state that so soon as practicable they will insist on milk from cattle free from tuberculosis. A possible means to this end would be to insist on the tuberculin test of all herds supplying milk. Those that reacted but showed no physical signs would be milked for the season until their milk decreased to a point where the cow was unprofitable. The cow would then be sent to the slaughter house, and if it passed examination it would be sold as food, if not, it would be utilized for other purposes. Many farmers always make a practice of sending their cows each year to the butcher instead of holding them over. They consider it the most economical method for all except high grade cattle. The fact that these cattle have reacted insures a careful examination, while at present similar cows are passed with slight investigation.

Another matter that needs regulation is the temperature at which milk is kept. The cleanest milk when kept at a high temperature soon sours. After much investigation a temperature of 50° Fahr. has been decided to be low enough to keep the milk bacteria from increasing rapidly and one easily maintained by the farmer, railroad and dealer. In some cities, as New York and Toledo, for instance, last summer large quantities of milk were dumped in the gutter because the temperature was found to be five or more degrees above the limit set. Some objected that much of this milk was good. That was true, but the point was it would have been better if it had been kept cool, and there was no way of enforcing a necessary and reasonable law except by making examples of those who willfully broke it.

The difficulty of procuring funds enough to employ sufficient inspectors to look after the production and shipping of milk has caused the laboratories to try and devise means which will detect errors.

Thus the number of bacteria in samples of milk is estimated. In Boston it is illegal to sell milk containing over 500,000 bacteria per c. c. This regulation is made because there is no excuse for one c. c. of milk containing on the average 500,000 bacteria. It must have been produced in a filthy way, or shipped warm or be very old to have this number. It is true that such milk would not harm an adult or when sterilized seriously injure the average infant, but it is decidedly worse than it should be, and if produced so carelessly, it is probable that it would not have been safeguarded from the germs of the contagious diseases of men or cattle. Another test reveals under the microscope pus cells and streptococci and thus indicates that the milk of diseased cattle is being sent. Philadelphia has especially developed this test and finds it of great value in locating cattle with diseased udders.

The bacterial count and the microscopical examinations are thus detectives ready to point out unhygienic methods. For the same purpose samples are taken by the chemist and thus the extraction of cream, the addition of water or the use of formaldehyde and boric acid are discovered.

The fact that it is impossible at present to provide a great city with as safe and pure a milk as is desirable has started a movement to make accessible to all a very pure supply which is produced and handled by the best known methods. As a rule a society of physicians works in connection with the Health Department of the city and through trained inspectors supervise the production and sale of the milk. It guarantees proper conditions on the farms, sterilization of all bottles and utensils coming in contact with the milk, purity of the milk and freedom from excessive numbers of bacteria. Special precautions are taken to prevent any pathogenic bacteria from man or cattle getting into the milk.

The farms supplying this milk act as examples to all adjacent farms, and help to raise the general standard. Over 10,000 quarts of such milk are being produced daily in New York City alone. In New York City the Department of Health co-operates with the private commission. It buys the milk for its hospitals under the guarantee of the commission and gives the officers of the commission the use of a laboratory room for the chemical and bacteriological tests. The work has greatly developed, so that a separate commission has been established for Brooklyn. The requirements which are strictly lived up to may be of interest to cities which are thinking of starting such a movement, and can be obtained by writing to the milk commission. The co-operation of the Department of Health with the private commission helps very much to reduce the expense of the supervision. In New York state the Commissioner of Agriculture, Mr. Wieting, aids the work by having state inspectors apply the tuberculin test and examine the herds.

The two circulars issued by the Department of Health which were alluded to in the report are the following:

RULES AND REGULATIONS WHICH MUST BE OBSERVED BY FARMERS AND DAIRYMEN IN THE CARE OF COWS AND HANDLING OF MILK SHIPPED TO THE CITY OF NEW YORK.

[TO BE POSTED ON ALL DAIRY FARMS.]

1. As a condition to the issuance of a permit for the sale of milk in the City of New York, all farms and dairies should be at all times open to inspection by the officers of the Department of Health.

THE COWS.

1. The cows must be kept clean.
2. Manure must not be permitted to collect upon the tail, sides, udder and belly of any milch cow.

STABLES.

1. Cows' stables must be well lighted and ventilated.

2. Floors must be tight and well drained.

3. Manure must be removed from the stalls and gutters after the morning milking and also before the afternoon milking, where the cows remain in the stable all day.

4. Walls and ceilings must be kept clean.

5. The ceilings must be so constructed that dust and dirt therefrom shall not readily fall to the floor or into the milk.

6. Stables must be whitewashed at least once a year.

THE WATER SUPPLY.

1. The water used in the barn and for washing milk utensils must be free from contamination.

THE MILK HOUSE.

1. A milk house must be provided, which is separated from or connected with the stable by a covered passageway. It must be separate from the dwelling house, or at least have no direct communication with it.

2. It must be kept clean and must not be used for any purpose except the handling of milk.

THE MILKERS.

1. No person having any communicable disease, or one caring for persons having such disease must be allowed to handle the milk or milk utensils.

2. The hands of the milkers must be carefully washed immediately before milking.

THE UTENSILS.

1. All milk utensils, including pails, cans, strainers and dippers, must be kept thoroughly clean and must be washed and scalded after each using.

THE MILK.

1. Milk from diseased cows must not be shipped.

2. The milk must not be in any way adulterated.

3. The straining of milk must be done in the milk house only.

4. All milk must be cooled to a temperature not above 55 degrees within two hours after being drawn, and kept thereafter below that, and must be cooled to 50 degrees or less if not delivered at the creamery twice daily.

5. The use of any preservative or coloring matter is an adulteration, and its use by a producer or shipper will be a sufficient cause for the exclusion of the product from the City of New York.

RECOMMENDATIONS.

In addition to the preceding rules, the Department makes the following recommendations:

THE BARN YARD.

1. It should be well drained and dry and should be as much sheltered as possible from the wind and cold.

2. Manure should not be allowed to collect in the barn yard, and should not be at any time in contact with the stable or milk-house.

THE STABLE.

1. The cow stable should have an abundance of light and ventilation. The ventilation should preferably be from the top.

2. There should be at least 600 feet of air space for each cow.

3. It is desirable that the place where the cows are kept be used for no other purpose. A cow barn should not be used as a storage place for straw, hay or other feeds, or as a wagon or tool house, as the dust and dirt which accumulates in a place of this character is liable to drop into the milk while being drawn.

4. Stable floor should be made tight and be of some non-absorbent material.

5. Cement or brick floors are the best, as they can be more easily kept clean than wood or earth.

6. If the space over the cow is used for storage of hay, the ceiling should be made tight to prevent chaff and dust from falling through. The practice, somewhat common among farmers, of packing hay, etc., on loose poles over the cows is exceedingly bad, since it invites the collection of dust and cobwebs, and the difficulty of keeping the stable clean is increased.

7. The stable should be whitewashed twice a year.

8. The manure gutter should be from six to eight inches deep and should be kept free from manure.

9. The use of land plaster or lime is recommended upon the floors and gutters.

10. The flooring where the cows stand should be short enough so that all manure will be dropped into the gutter and not upon the floor itself.

11. The floor should be swept at least an hour before milking in order that the dust may have a chance to settle before the milking is begun.

12. If individual drinking basins are used for the cows they should be frequently drained and cleaned.

THE COWS.

1. The cows should be kept at all times in a healthy condition, and an examination by a veterinary surgeon should be made twice a year.

2. The cows should be groomed daily and all collection of manure, mud or other filth should not be allowed to remain upon their flanks, sides, udders, or bellies during milking.

3. The clipping of long hairs from the udder and right side of the cow is of assistance in preventing the collection of filth, which may drop into the milk.

4. The tails should be cut so that the brush should be well above the ground.

5. In winter the tail may be clipped.

6. The cows should be bedded with sawdust, shavings, dried leaves, straw or some equally clean material.

7. The use of horse manure for bedding is to be condemned.

8. To prevent the cows from lying down and getting dirty between cleaning and milking, a throat latch of rope or chain should be fastened across the stanchions under the cow's neck.

THE MILKING AND MILKERS.

1. The milkers should be clean.

2. Their hands should be thoroughly washed with soap and water and carefully dried on clean towels before milking.

3. Clean overalls and jumpers should be worn during the milking of the cows, should be used for no other purpose, and when not in use should be kept in a clean place protected from dust.

4. The hands and teats should be kept dry during milking.

5. The practice of moistening the hands with milk is to be condemned.

6. The first few streams from each teat should be rejected, as this contains more bacteria than the rest of the milk.

7. All milk drawn from the cows 30 days before and 10 days after calving should be rejected, and also all milk from diseased cows.

8. The pails in which the milk is drawn should have as small an opening at the top as can be used in milking. This renders the collection of dust less likely.

9. The milking should be done rapidly and quietly, and the cows should be treated kindly.

10. Dry fodder should not be fed to the cows during or just before milking, as the dust therefrom will fall into the milk.

THE MILK.

1. The milk should be removed as soon as drawn to the milk house and strained and cooled to the proper temperature at once.

2. A good plan is to strain the milk into cans which are standing in ice water which reaches the neck of the can.

3. The more rapidly the milk is cooled the safer it is and the longer it will keep sweet.

4. Ice should be used in cooling as very few springs are cold enough for the purpose.

5. If aerators are used, they should stand where the air is free from dust or odor, and on no account should they be used in a stable.

6. Milk strainers should be kept exceedingly clean and scalded a second time just before using, and if cloth strainers are used, several of them should be provided in order that they may be frequently changed during the straining of the milk.

RULES AND REGULATIONS WHICH MUST BE OBERVED BY THOSE OPERATING CREAMERIES AND SHIPPING STATIONS.

[TO BE POSTED IN ALL CREAMERIES.]

THE BUILDINGS.

1. The floors of these buildings must be constructed of some material which will render them water tight and must be graded and drained towards one or more points from which water must be carried away by suitable drains. Floors of cement or stone are the best for this purpose.

2. The floors must be drained by water tight gutters either into cesspools so situated as not to be offensive or conducted to such a distance as not to cause a nuisance.

3. The water used for cleaning the pails, cans and other utensils must be from a public water supply, or if drawn from a well or spring must be approved by this Department.

4. The milk room must be used for no purpose other than the handling of milk and must be clean and well ventilated.

5. Premises must at all times be free from a collection of water, rubbish or any offensive material.

6. Cooling tanks for milk must be tightly constructed of non-absorbing material and frequently cleaned. The water must be changed so frequently as not to become offensive.

7. Walls and ceilings must be kept clean.

8. Aerators and coolers must be protected from dust and from impure air.

THE EMPLOYES.

1. No person suffering from a contagious disease or one in attendance upon such patient, shall be employed in the handling of milk or milk utensils.

2. All employes who handle milk and milk utensils must be cleanly in their habits. The garments worn by such employes must be kept in a clean condition.

3. Spitting in or upon any part of the building must be absolutely prohibited.

THE MILK.

1. Milk of a temperature above 60 degrees must not be received at the creamery or shipping station.

2. Milk must be handled as little as possible and all unnecessary exposure to the air must be avoided.

3. Milk must be rapidly cooled to a temperature of 50 degrees or less and so kept until shipped.

4. All pipes through which milk is allowed to flow must be so arranged as to be easily and thoroughly cleaned.

5. All milk utensils including cans and bottles must be kept clean and sterile.

6. Managers of creameries and receiving stations will be expected to refuse to receive milk from farmers who do not obesrve the rules of the Department.

RECOMMENDATIONS.

1. In addition to the foregoing rules, the observance of which the Department of Health demands, the following recommendations in the construction of creameries and the handling of milk are presented:

A. Creameries should be well lighted. Ventilation should be ample, preferably through the roof.

B. Milk should be handled in rooms supplied with natural light.

C. Creameries should be so aranged that the milk may flow by gravity from the point where it is received to its final point of handling. Pumps, which are always difficult to keep clean, should never be used.

D. Outside dust should be prevented from entering the room where milk is handled, and flies should be excluded.

E. The rooms should be plastered or ceiled to avoid places where dust may gather.

F. Frequent painting or whitewashing is strongly urged.

G. The receiving tanks, mixing vats and tanks upon the bottling tables should be provided with covers.

THE NEED OF A GOOD DISTRIBUTION AND INSPECTION OF MILK.

By Dr. GONZALO AROSTEGUI, of Havana, Cuba.

Few topics will be of more interest to the physician, the philanthropist, the hygienist, and the general citizen, than the study of milk, its source, its good quality, its rich nutritive qualities, its freedom from pathogenic germs. It is a complete food, and one of those most widely distributed in nature. It is segregated by all mammals temporarily, and the newborn child finds in it its first fount of life and its only nourishment during the first months, as also do the young of the larger species of animals, beginning with the quadrumanae. This liquid may be considered a universal food, as it contains all the elements necessary to sustain life. When pure it is an invaluable food for children, is palatable to adults, and has no equal in convalescence and in the treatment of certain diseases. It is only necessary for me to cite cancer of the stomach and Bright's disease. A well-known American writer and physician, Dr. S. Weir Mitchell, has recommended it with much success in the treatment of hysterics and neurasthenia, the fashionable diseases. Its importance will be understood when it is known that the laborers of Sweden and the Bedouins feed themselves almost exclusively on milk, and that Munich consumes daily 562 grams for each inhabitant, Konigsberg 238, Paris 228, London 107. The consumption in Havana is also very great.

It is impossible to distinguish good milk by simply looking at it, that is to say, that which contains all its component parts, which has not been added to or taken from, from the impure, from the "baptized," as we say of that to which water has been added, or from which the cream has been taken, or to which some foreign substance has been added. There is nothing which can add to the nutritive value of the natural milk; its excellence is based on its own conditions, on the health of the animals, on the methods of obtaining it, on the cleanliness and ventilation of the stables, on the means employed for its preservation.

It is necessary to teach the public the value and the need of purity in food, and the necessity of demanding it in the products which they must consume. In this way they will oblige the dealers to sell accredited and guaranteed goods, under the best conditions.

Children, who are protected and defended by paternal solicitude, and to whose future welfare governments are giving so much thought, are those who suffer most from milk of bad quality. There are nations, like France, which lose 150,000 children annually, and this loss is occasioned by gastro-entertis[1] (summer complaint), which also makes such ravages in the great neighboring Republic.

The milk which is more generally used by us is that of the cow; sometimes, but almost always by prescription of a doctor, that of the ass, and on a few occasions that of the goat, and rarer still that of the mare. Mother's milk is reserved for its especial use, although on occasions tender-hearted and self-sacrificing women have given to yellow fever convalescents "the white blood," as Ambrosio Paré used to call it.

Milk is an opaque liquid, yellow white or bluish, of slight alkaline reaction, sometimes neutral in the herbivorous, and usually acid in the carnivorous. Its density is 1030 to 1033. This is the standard. Milk to be considered of good quality, must fulfill the following requisites:

1. Register 30 degrees in a Quevenne lactometer at a temperature of from 15° to 18° Centigrade. 2. Contain at least 36 grams of fat per litre, measured by the galactometre, fat which should have the chemical composition and the physical properties of the natural fats. 3. Give on analysis a total of dry materials not less than 25 grams. 4. Not curdle on boiling. Milk which fails in these conditions must be considered as of an inferior class and should be withdrawn from market, and everyone who adulterates it in any way should be heavily fined. This question is fully treated in the regulations which have been recently discussed and approved by the Supreme Board of Health. In England the delivery of milk is carried on under medical inspection; in New York, and above all in the summer time, the health department appoints a body of inspectors every year, consisting of fifty at least, who have authority to close dairies, and throw into the river the milk found in those establishments which do not comply with the rules laid down by the board of hygiene.

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[1] In Havana the infantile mortality during the last four years was as follows:

Years.	Deaths from Enteritis.	Up to 1 Yr.	1 to 5 Yrs.	Total.
1901	772	1,453	363	1,816
1902	499	1,260	552	1,812
1903	268	984	528	1,512
1904	418	1,165	568	1,733

The demand in Havana is supplied from the milk stables of the city, which have improved during these last years (1), but which are very far from being model milk stables, but it is only just to state that they have taken the first steps to improve the conditions of these stables. The supply is derived, also from the milch cows which many well-to-do people have in their *patios,* and from the cows kept in the towns near Havana, from which the milk can be brought in carts or wagons. This milk is generally baptized near Havana; it has its Jordan in the Almendares River, in Regla, and in other more distant places. It also comes daily from other more remote places, distant one or two hours by railroad, brought in great milk cans.

Milk ought to be mechanically, chemically, and bacteriologically pure. Mechanically: it is known that milk which has stood presents at the end of a certain period in time, interesting modifications, losing its homogeneous appearance, and separating into four well defined layers, the lowest being calcium phosphate, the next casein, the third sugar of milk, or lactose, and on top the fatty substances. The soluble ferments, the lactic ferment, and Bechamp's *sacrificanto,* or sugar compounds, also the traces of urea, are not separated. Chemically, milk contains water; albuminous substances, casein; a fatty substance (the butter); sugar, lactose; salts, soluble and insoluble; and some gases like oxygen, nitrogen, carbonic acid, free or combined. Milk which contains other substances may be classified as adulterated, falsified, or altered. Bacteriologically, its study is most important, although all the two hundred or more different species of bacteria discovered and described are not dangerous. A connoisseur of these matters, Dwight Chapin, divides the bacteria into those which produce putrefaction, and the pathogenic, or those which produce diseases. Their number is marvelous, as may be seen from the following table. In a single experiment Miguel has found:

At the end of	1 hour	9,500	bacteria per cc.
	2 "	11,000	
	3 "	13,500	
	4 "	30,000	
	7 "	93,000	
	8 "	230,000	
	9 "	211,000	
	25 "	63,510,000	

Figures which need no comment, and which show the necessity of a special technical watchfulness.

The changes in milk, aside from the existence of the bacteria, are as follows: 1: Sour milk, that is, milk which curdles a short time after milking. 2: Watery milk, the use of which may produce diarrhea. 3: Greasy milk, a state which is not lasting. 4: Milk which has a tendency to curdle (sometimes that which is obtained at night.) 5: Viscous milk, due to lactose fermentation. 6: Bitter milk, the name indicating its quality. 7: Soapy milk. 8: Blue milk. 9: Yellow milk. 10: Red milk.

It having been shown that milk is a food of the first order, the spontaneous changes which may take place after milking being known, also the impurities to which it is subject, and with a knowledge of the great number of bacteria which germinate in it, since it is a good culture, bearing in mind the changes which may take place because of the alterations of the glandular acini, because of the state of health of the animals, and even from their food; it being well known that it may give rise to a great many diseases, such as the terrible gastro-enteritis of early infancy, and even some epidemics, such as typhoid fever, as has been well proven, the interest in its study, as one of the most important factors of public hygiene and of the hygiene of early infancy can well be understood. It is not surprising, then, that a very learned Spanish writer, Vicente Vera, has entitled his article in favor of the inauguration of important reforms in the delivery of milk "Madrid á la Europea," such was the importance he gave to the question of which he treated in his article.

Other countries have for a long time realized this great necessity and, beginning with our present teacher, the Great Republic, which has extended its hand to us and protects us in the progressive development of the nation, watching us in the question of hygiene at times with too much severity, I mean the United States, in almost all the large capitals they are most rigid regarding the source, the manner of keeping, and the distribution of the milk of animals. It is there they produce more of that which, in the form of condensed milk, is exported to other countries, and of which large quantities are consumed in Cuba. There cleanliness and purity in the matter of milk are carried to the utmost limits of scrupulousness, even the race of the animal producing the milk being studied, the most appropriate food, the hygiene of the stables, of the vessels, of the dispensaries, etc., even to the certification of purity and rich quality of the milk to be distributed. There they have milk dealers' associations—to the number of 44—and of these some receive a subsidy. They have excellent means for distribution and delivery among the masses, and have special periodicals, like *The American Dairyman, The Dairy World, The Creamery Journal, The Milk Reporter, etc., etc.* There the practice and teachings of Dr. Morgan Rotch, of Boston, a physician eminent in the practice of pediatrics, have led to the establishment of the Walker-Gordon Laboratories for the preparation of this food according to medical prescription. These are advances, great progresses, I point out, the advantage of which it is unnecessary to discuss now. In this city the problem of infant feeding is solved, because the majority of Cuban mothers nurse their children; whenever, for any circumstances beyond their control, they cannot do it, wet nurses are hired, and if this is not possible they use cow's milk. The poor frequently use condensed milk. With the increase in population this question acquires, without doubt, greater proportions and difficulties, which fortunately have not yet reached Cuba. Canada made known her great advances at the Universal Exposition of 1900. The co-operative system has been established. It may be said that for quality and quantity, the Dominion occupies one of the foremost places in the world in this industry. The Latin-American countries are in conditions like ours, an abundance of the product, poor as to cream, negligent in the scientific bases of the production and preservation. The furnishing of milk is left to Nature, and to a very few principles which have been taught by experience.

The interest of European cities and countries in providing their citizens with good and abundant milk, which, in my opinion, is a thing almost as important as to give them good water, pure air, and quick sewage under the best possible antiseptic conditions. For example, Paris supplies milk from cows kept in stables in the city, in the suburbs, or from the farms of the Department. France has a national school dedicated to the milk industry, a station supported by the government. eight practical dairy schools. There are, besides, co-operative societies, and in Paris there is a society for the promotion of the industry, with a journal and a special committee. The Agriculture Department has recently created a Bureau of Agricultural Information, with the object of facilitating data regarding national and foreign productions, the conditions of foreign markets, etc. Germany has twelve scientific establishments dedicated to this industry, and many universities; Bonn, Leipzig, Koenigsberg, have agricultural institutes for the theoretical and practical teaching of the industry. It is enough to say that one of these departments is under the directorship of Backhaus, in the University of Koenigsberg. Austria has five schools; in Vienna the Department of Agriculture has a department for the inspection of the industry. Belgium has four schools, and publishes the *"Practical Dairy."* Lectures are given, and they have besides what are called "moveable schools." Recently they have issued the "Revue Generale du Lait." Great Britain has four schools. There is more milk imported into that country than to any other. In Switzerland the milk industry is very important; from there the European market is supplied with condensed milk. It has about fourteen periodicals dedicated to the study of the subject. But Denmark is the nation which should serve as a model, as it has 2,400 dairies. That which has most contributed to its progress in this line are the societies called "Testing Associations." The capital, Copenhagen, in the opinion of an author as distinguished and sincere as Enrique de Rotschild, is the European city best provided with model dairies. The production is carried on under hygienic conditions which cannot be improved upon. Realizing the advantage to themselves, the dealers conform to the requirements of the law. The veterinary inspection is very efficient. This is a good example for our dealers who do not take into account the degree to which they prejudice their own interests, nor the crime which they perpetrate by supplying baptized, altered, or adulterated milk, or that which comes from sick animals, or from unclean places or vessels.

How far behind is our city in these great advances, on which depend in part the future and the strength of its citizens? And when the whole civilized world is giving attention to that problem, which they consider of the first importance, what pain the smile of the unbelievers in hygiene, who bring forward the single exception to the rules and general deductions of theory, practice, and experience, causes to even the most hopeful.

Everything connected with the production of milk should be carefully watched, regulated and foreseen. The statutes of the Superior Board of Health embrace some extremes which have been discussed and approved at its meetings, which might be summed up in a general plan as follows:

1. a. The creation of practical schools under the supervision of the Secretary of Agriculture, in which the importance of milk as a complete food is taught; which is the better class, what animals produce it in the greatest abundance; what is the best race of cows; what are the more general diseases of milk; what is the best hour for milking the animals; what illnesses are produced by uncleanliness; diseases of the udder or of the other organs of the animal. Danger to children from change of milk. Fines which are imposed for adulteration, etc.

b. Manner of obtaining milk. Description of the udder; how to use the hands when milking. Study of extracting tubes (trayeur); advantages and inconveniences of the machine for milking cows.

c. General hygienic principles for obtaining milk; cleanliness of the deposits, or vessels; keeping of the milk. Fundamental principles; for example, one-fourth of the children of civilized countries die before they are five years old; almost one-half of this number is from gastro-enteritis; gastro-enteritis may be prevented by watchfulness and good milk. Disadvantages arising from the sale of colostrous milk, or of that coming from badly fed animals.

d. Model dairy establishments. Their usefulness. Stables: how they should be equipped. Water for the animals. Delivery of milk. Pure, pasteurized, sterilized, even boiled at 108° it is nourishing if it is hermetically sealed. Milk should be sold with all its component parts. Following the example of Nocard, as well as of many others, "it is recommended that milk should not be drunk unless boiled." Precautions for the prevention of the access of tubercular bacilli. Examination of milch cows; proof of tuberculosis; the necessity of sacrificing sick cows, etc.

e. Statistics: Number of milch cows in the stables. Milch cows of the nearby farms and dairies. Number of liters of milk consumed. Normal condition of milk in Cuba.

f. Study to reduce the cost of milk, at the same time supplying the best quality.

2d. The appointment of competent medical and veterinary inspectors to examine everything in connection with milk, under the supervision of the board of health. These inspectors must prove their especial technical competency, theoretical and practical, from the use of the instruments, lactometers, instruments for testing cream, etc., to the determination of the ingredients of the milk and the examination of the animals. Should visit the stables, dairies, etc. Attention should be given to the morals of the employes. The use of antiseptics in the milk should be prohibited.

3d. The prohibition of the sale, under the name of milk, of any product which has not been obtained by the direct *milking* of healthy animals. Adding any substance to milk or taking one from it makes it lose its true qualities, and is a falsification.

4th. To prevent the sale of colostrous milk.

5th. To fix the normal standard of milk, after many examinations.

6th. Manner of gathering samples for examination; guarantee for the seller; two samples, with dates, name, etc.

7th. Fines to be imposed on defrauders, etc.

To sum up, what I recommend is general instruction and propagation of knowledge on the subject; the establishment of model dairy farms; antiseptic and well ventilated stables; clean vessels, smooth and enamelled; scientific and efficient inspection, supervised by the

Superior Board of Health, and laws to determine the penalties to be imposed on violaters.

The public authorities are in charge of the social hygiene, and this question of milk is a hygienic consideration of the highest order. Milk which has been altered or tampered with is a danger to children. Every change, however slight, is an attempt against the public health. Those who suffer most because of these frauds are the children, the dependent, the poor, and it is not in opposition to commercial liberty to demand that the product supplied be what the buyers want, what the labels say, and what the words mean.

NOTES.

(1) To-day there are 71 stables for cows in the city with 790 cows. The average product is ten liters of milk per cow. It is almost impossible to calculate the number of liters which are actually consumed in the city, although it is known that the dairies receive 3,200 liters. The minimum number of liters sold at each dairy is 80, and there are 220 dairies.

(2) A recent incident in Cologne is remarkable for its rarity. It treats of a dealer who was arrested for a singular misdemeanor. It is said that he used to bathe himself in the milk before he sold it, as he had heard that milk baths were good for the health.

INFANTILE ALIMENTATION. PARALLEL BETWEEN THE LACTATION BY NURSES AND BY ARTIFICIAL MEANS.

By Dr. ALFONSO PRUNEDA, of Mexico City, Mexico.

Everything connected with infant hygiene, is of special interest. The hopes of the body corporate are based on the future generation, which is expected to furnish active and useful members for the future, and consequently the community is interested in their healthy and vigorous development, so that later on, they may become useful and productive citizens. Infant hygiene is, therefore, probably the most interesting branch of hygiene, and especially that part which relates to the alimentation of children, as the child, above all things, requires to be nourished for the double purpose of supplying its present needs and of utilizing material for his progressive development. Nature has made admirable provision for these pressing necessities, by means of the maternal milk, the perfect food that combines in itself the albuminoid substances, the fats, the hydrates of carbon and the salts which are required; in short, everything of which the small organism has need for its own physiological prosperity.

Unfortunately, in spite of the fact that maternal lactation is the normal and perfect system of feeding a child, it is not always within his reach, whilst in many cases, even though it is within his reach, it is notoriously injurious. Different causes, some of an organic character and others of a moral and social origin, sometimes interfere with maternal lactation and render it necessary to appeal to other methods that are not provided by nature.

In some cases, the mother has not a sufficient supply of milk; she suffers from some serious affection that will not permit her to suckle the child, such as tuberculosis, cardiac lesions, local lesions in the breast that also form an obstacle to lactation; in short, she is organically incapacitated for the fulfillment of one of the greatest duties, if not the greatest, that of bringing up her child. Pinard has said that the mother's milk belongs to the child and that the breast and heart of a mother cannot be replaced. Marcus Aurelius also said that the woman who has given birth is only half a mother and cannot reach the full maternity until she has brought up her child.

But in other cases, the impossibility of maternal lactation is of a very different origin, and I do not hesitate to say, of much greater importance. The mother cannot bring up her child on account of the social atmosphere by which she is surrounded; by the necessity of working in a shop or factory, in order to earn her own subsistence or else she does not desire to undertake that task because she fears that the suckling child will disarrange her figure, or because she feels that her social duties are more pressing than the maternal. These two last impediments: the social and the moral, are by no means rare, but on the contrary they are frequently found in practice to constitute the reason for seeking a substitute for the maternal lactation, which, as said by Pinard, cannot be replaced.

Deprived of his mother's breast, the child goes to be fed either by a wet nurse or with milk from animals, and especially from the cow. The purpose of this short paper is to examine these two methods of artificial alimentation, and to compare their advantages and objections.

Mercenary lactation presents the only advantage of furnishing the child with a food that is similar in composition to that which his own mother has been unable to give him; but, nevertheless, this advantage is often diminished because the child cannot digest any milk but that coming from his own mother, and it then becomes necessary to change wet nurses, until one is found whose milk is digestible by the child, and at the same time sufficiently nutritious. Apart from this advantage, I can see nothing but objections against mercenary lactation; even though the child may be well nursed, the nurse's milk, like the mother's is exposed to accidental changes that for a time may render it injurious, by the food or drink that is taken, by emotions, sickness and other causes. These causes, that can be avoided by the mother, especially the first two, are difficult to foresee in a wet nurse, who does not see in the child the fruit of her own bosom, but simply a means for earning a salary. However much the nurse may be watched, she will not neglect any opportunity that may arise for eating to excess, for making use of alcohol, etc., and all these excesses, which cannot be made without prejudice to the small being, are easily avoided by a mother, who in most cases is fully alive to the importance of her mission.

I make no mention of the possibility of the nurse transmitting some infectious disease to the child, such as syphilis. This serious objection can be entirely provided for by a careful previous examination of the nurse, who cannot hide from the experienced eyes of a physician all the traces of a syphilitic infection.

But there are also other serious objections that induced Fournier to declare "that lactation by means of a wet nurse is illogical and immoral." Every nurse who accepts the suckling of a child, abandons her own, in this way depriving him of his natural food, to which he has so good a right; this abandoned child is also submitted to an alimentation of an inferior character, or is in his turn brought up by another nurse or by artificial methods that probably are incorrectly applied, and therefore present serious danger. This child runs the imminent risk of dying, and according to French statistics. sixty per cent of these cases succumb, and we therefore see that in this case, there are two guilty mothers, according to Pinard, the wet nurse who has abandoned her own child, and the other who purchases with money the milk that belongs to another child for her own.

This abandonment and unworthy traffic can only merit the unanimous reprobation of society, in view of the great immorality that it implies, a blame that applies both to the one who sells her milk and to the one who buys; an immorality that loosens the ties that never ought to be loosened, of the two mothers, of whom one is probably more to blame than the other.

As an isolated and unique case, mercenary lactation might unquestionably be of advantage to a child, and might even perhaps not be accompanied by the death of the other: but, looking at the question all round, we see that the interesting problem of diminishing infant mortality is far from being resolved by this class of alimentation, which in most cases sacrifices a life in order possibly to save another.

There are other objections remaining that, although of less importance, cannot pass unperceived. A good wet nurse is difficult to find; her moral sense especially leaves much to be desired and the introduction of this strange element into the intimate circle of the home is the cause of a great deal of unpleasantness. All mothers unanimously complain of the wet nurses, even though they are so indispensable, in order to allow the former to abandon their children. Besides this, a wet nurse represents in the family, a disturbance in its economy that cannot always be supported, and that very possibly will not be compensated by the results to the child, as is very often found to be the case.

At the same time, we cannot but recognize that in spite of all the objections above indicated, there are occasions which probably will become from day to day rarer, in which the wet nurse becomes entirely necessary. The child cannot digest any but woman's milk and cannot tolerate any other class of food, and in such cases the wet nurse becomes a really necessary evil, and as such there is nothing to be done but to tolerate her.

The child who is deprived of his mother's milk can also avail himself of the milk of different animals as food, of which, for well known reasons the cow is to be preferred. Nevertheless there are two objections to this milk; there are many probabilities that it may be infected before reaching the child, and besides this its composition is far from being similar to that of the woman. These two difficulties surround artificial alimentation with danger, but they are susceptible of remedy to a great extent. Many observers even consider that the question of the composition of the milk is not of such great importance as that of the probable infection. Many cases have been known of children who have been fed with cow's milk, when pure, have not resulted in any disorders of the stomach. Others consider that the excess of casein and the scarcity of hydrocarbons in cow's milk, can be remedied by the addition of water and lactose, which, nevertheless, by the dilution of the milk, might diminish its nutritious character and oblige the child to take more food in order to compensate for that diminution. My personal observation has taught me the uselessness of giving lactose, that frequently produces diarrhea, besides which, even by slightly diluting the milk with boiled water during the first months of life, children prosper and are well developed. In this matter, as in many others, the teaching of practice does not bear out the mere speculations of theory.

As regards the danger of infection and its consequences to the child, there is complete agreement between all parties. Cow's milk, which is susceptible of infection with tuberculosis, even before it is drawn from the animal, is so much manipulated before it reaches the child by the milker, in the cans in which it is carried, in the feeding bottles, etc., that it cannot avoid infections. Sedgwick and Batchelder, in the year 1892, made an investigation in Boston of the number of germs in milk, and found that a few hours after being drawn from the cow, it already contained 69,143 micro-organisms per cubic centimetre, and this number increased as the time passed, until it reached the number of 4,577,000 in the same quantity of milk. Amongst these germs, some are liable to be of a pathogenic character, proceeding from the cow, such as tuberculosis, but the commonest are the saprophytes of the milk, that produce its fermentation and putrefaction, and that cannot be pathogenic for infantile systems. Moreover, there is always the danger that other and pathogenic germs may fall into the milk, such as the Eberth bacillus, etc., through accidental contact with infected substances.

Some of these germs disappear if the milk is heated to a temperature of 85° or more during a few minutes; but the spores of the peptonizing bacteria do not die under a temperature of 100 degress. The addition of some antiseptic substance to the milk can also prevent the fermentation. The sterilization of milk is founded on these two facts and is intended to eliminate the danger of infection, thus bringing it nearer to the human milk, which passes in a perfectly sterilized form from the breast to the child's mouth, without any intermediary.

The theoretical idea is therefore to employ perfectly sterilized milk in artificial alimentation; but practice has nevertheless taught us that this result is not absoutely indispensable. Gillet says, "there is no advantage in having the milk absolutely sterile, but on the contrary." A very high temperature also destroys certain fermenting agents that are to be found in the milk and that are of assistance in its digestion. Besides this, as the temperature is raised above 100°, certain chemical changes that are not as yet well known, injure the nutritive value of the milk and the digestibility of the casein. The sterilization at a temperature of over 100° should be reserved for those occasions on which the milk is utilized at a great distance from the place where it is drawn, as it can thus be kept even several days without undergoing any alteration. This method of sterilization is also employed by those who have to furnish large quantities of milk to charitable establishments, such as asylums, dispensaries, drop of milk stations, etc. But in our daily practice, in which milk can be obtained on the same day as it is drawn, it is only necessary to boil it, or Pasteurize it. Holt says, that a temperature of 167° Fahrenheit is quite sufficient for ordinary purposes. The ebullition at or about these temperatures may be prolonged for some minutes without any decomposition of the milk, in spite of the non-destruction of the spores, but always provided that it is consumed the same day. The milk may not be bacteriologically sterile; but it will be sufficiently purified not to hurt the child.

My master, Dr. José Terrés, Professor of Pathology and Internal Clinics of the Faculty of Mexico, advocates a simple process that gives the best results. Immediately after the milk is drawn from the cow, it is boiled in a covered iron pot. It is to be noted that in Mexico, which is situated at an elevation of 2,277 metres above sea level, the boiling point is only 92°. Once the milk has been boiled, it is well covered and placed where it is safe from dust and other impurities, and an hour afterwards the cream is skimmed off, and it is then decanted into the bottles which the child is to use, and these bottles are covered with perforated rubber stoppers, in which glass rods can be introduced when required. These bottles are then heated in a "bain-marie" in which they are left until the water has boiled for five minutes, after which they are taken out and the glass rods introduced into the holes in the stoppers and tightly closed, the milk being then ready to give to the child.

All the utensils employed, such as bottles, rubber stoppers, glass rods, etc., must be perfectly washed before and after use in boiling water to which bicarbonate of sodium has been added, and in the intervals when they are not in use, they should be kept in well boiled water.

With this very simple manipulation, the milk is rendered fit for artificial feeding, as has been proved by the extensive practice of Dr. Terrés and other physicians who have followed his methods, by means of which many children have been successfully brought up, even from the date of birth.

If practice teaches us that by these methods of purifying the milk (complete sterilization, Pasteurization, and ebullition), we eliminate the danger of infection, it also teaches us that the results of this nutrition are highly encouraging.

Many objections have been made to the ebullition of milk; Vassilief has said that boiled milk contains azotic principles that are not so easily assimilated as raw milk; it has been asserted that the ebullition renders the milk less digestible; it has been said that it produces rickets in the child, serious intestinal affections, etc. The facts have triumphantly answered all these objections, and it has clearly been demonstated that a healthy child can assimilate the azotic and fatty substances in sterilized milk as well as in that which is not sterilized; Michel has investigated by experiments, and discovered that the coagulation of boiled milk is very finely divided and therefore facilitates the digestion; Variot, Budin and Dufor, who have made use of the sterilized milk on so large a scale, have never observed that it produces rickets in the children fed with it, or that it supervenes through the use of modified milk and the mixture of flour or other ingredients that are used for children's food. The same investigations have been made by Comby, who asserts that in Normandy, a greater success has been obtained by the women who bring up children on boiled milk than by those who employ raw milk. Variot, Budin and others have been enabled to reduce the rate of infant mortality through gastroenteritis to less than half what it was twenty years ago, thus saving many lives that will be useful to the community.

In Mexican practice, Dr. Terrés has found children to acquire a perfect development by the use of milk sterilized by the above process; other physicians also employ it with success and, in combination with Dr. Terrés, have initiated and maintained a real campaign against the wet nurses.

If sterilized milk at times causes victims, it is due either to the fact that the child can only digest human milk, in which case the wet nurse as already stated, becomes a necessary evil; or still more commonly, to the fact that this food is employed in an inadequate manner; either there are no proper precautions taken to observe strict cleanliness, too large a quantity of milk is given to the child, the feeding is done at irregular hours, etc.

In short, lactation by means of boiled milk furnishes the child with a food that is deprived of its impurities, and which, although theoretically inadequate on account of its composition, in practice is found to give excellent results.

As its manipulation is simple, it comes within the intelligence of the great majority of mothers, who will undoubtedly look after the preparation of the milk with the greatest care, whenever their unfortunate circumstances prevent their giving the child nourishment in the direct and natural manner. Artificial feeding brings the child close to the mother as much as the wet nurse separates him from her; in its preparation she can display all the affection and give all the minute attention that are peculiar to a careful mother. Whenever the mother is unfortunately deprived, through her economic necessities, of the privilege of bringing up her children, either at her own breast or by means of boiled milk prepared by herself, it becomes the duty of the community to care for those children and to take steps to do so on a large scale. France gives us a beautiful example of what can be done in this direction, by private initiative, ably seconded by the state. The Roussel law, the establishment of maternity consulting offices and dispensaries, the philanthropic work of the Lube, the "gouttes de lait," aspire to, and already realize, an increase in the vital forces of the great Latin republic. In Mexico, which advances under a firm hand in the path of progress, the establishment of similar philanthropic institutions, has already been initiated; the "positivista" and internal medicine societies, to which I have the honor to belong, and the upper classes of society are actively working to carry out this ideal, which is destined to bring about the most advantageous results.

These results are an urgent necessity, as in our country the rate of infant mortality is terribly high, and in this matter we have the misfortune to figure in the lowest rank among nations. As in other parts, this mortality is specially due to eruptive fevers, diseases of the respiratory and digestive organs, all of which take a prominent part in the statistics. In the year 1901, with a general mortality of 21,744 in the City of Mexico, there were 2,352 deaths from diarrhea among children of under two years, belonging to the lower classes of the community, that is to say, 10% of the total number. In 1902, we had 1,896 deaths from diarrhea amongst children, whilst the general mortality was 19,486, thus reaching 9.73%. In 1903, the general mortality amounted to 17,000, whilst the infant mortality from diarrhea amongst children under two years of age, was 1775, making 10.42% of the total number. These data are taken from the bulletin of statistics, which is published by the Government of the Federal District.

If we take into consideration that the immense majority of the cases of infant gastro-enteritis are caused by defects in feeding, we will understand the necessity of procuring that it should be as adequate as possible for the children. The practical physician amongst his patients and the hygienist, should all give special attention to this matter; the former, in each case advising the best course to be adopted for the child, who is entrusted to his scientific knowledge, and the latter proposing to the community and actively working for the acceptance of measures that are intended to furnish the proper food to the state's children. It is necessary to always earnestly advocate the necessity of maternal lactation, which is really the most adequate from every point of view; but, in the unfortunate event of this being found impossible, we should not hesitate to adopt some other method, and especially should we avoid the employment of wet nurses who, as has been shown, present so many objections, but rather make use of sterilized milk, that when properly and methodically applied, will fulfill its purpose, and thus save the lives of many children, who would under other conditions perish and raise the figures of infant mortality.

FEDERAL CONTROL OF VACCINE VIRUS.

By Dr. JOHN F. ANDERSON, Washington, D. C.

One of the provisions of the Act of Congress approved July 1, 1902, imposed upon the Director of the Hygienic Laboratory the examination of vaccine virus produced by manufacturers engaged in interstate sale thereof. Since the enforcement of this act a great lessening in microbial contamination has been marked.

Vaccine virus has been examined in the Hygienic Laboratory of the Public Health and Marine Hospital Service since early in the winter of 1901. Virus examined during the winter of 1901 gave a general average of 4,698 bacteria per tube and 4,809 per point, the highest for a tube being 30,080 and for a point 20,828. In the examinations conducted since the act went into effect the general average of tubes has been 309, for points 1,223; the highest for a tube being 1,501, and for a point 8,860.

The following table shows the highest, lowest and the average number of colonies found in tubes and points in 1901-02 and in 1904. It will be seen that, with only one exception, the counts for 1904 were considerably lower than for 1901-02, this one exception being in a manufacturer whose product has always averaged particularly low in contaminating organisms and has given a high percentage of "takes."

TABLE COMPARING THE BACTERIAL CONTAMINATION OF VACCINE VIRUS BEFORE AND AFTER THE PASSAGE OF THE ACT.

Manufacturer.	Date.	Tubes.			Points.		
		High.	Low.	Average.	High.	Low.	Average.
A Before Act...	1901–02	17,000	86	2,498	15,760	13	2,463
After Act....	1904	1,501	12	462	546	133	271
B Before Act...	1901–02	7,274	192	3,896	20,828	4,923	10,708
After Act....	1904	374	3	131	8,148	38	1,243
C Before Act...	1901–02	2,440	111	1,166	13,030	847	4,358
After Act....	1904	535	86	213	2,690	642	1,459
D Before Act...	1901–02	4	....	1	....	....	....
After Act....	1904	336	94	209	....	....	....

TABLE COMPARING THE BACTERIAL CONTAMINATION OF VACCINE VIRUS —CONCLUDED.

Manufacturer.	Date.	Tubes.			Points.		
		High.	Low.	Average.	High.	Low.	Average.
E Before Act...	1901–02	30,080	11,840	18,443	....	....	....
After Act....	1904	1,125	53	409	8,860	520	3,132
F Before Act...	1901–02	8,000	116	2,455	....	....	....
After Act....	1904	484	49	229	270	21	90
G Before Act...	1901–02	18,404	1,414	6,819	12,800	1,530	6,098
After Act....	1904	1,242	8	373	380	42	149
H Before Act...	1901–02	3,819	369	1,875	....	....	....
After Act....	1904	1,095	343	595	....	....	....
General average.							
Before Act...	1901–02	....	....	4,698	....	....	4,809
After Act....	1904	....	....	309	....	....	1,223

For the laboratory examination it is necessary to have twenty tubes or points; at least this number is necessary to determine the average number of bacteria per point or tube, the presence of pathogenic organisms and the potency of the virus. Ten vaccines—by this I mean either points or capillary tubes — are planted and counts made therefrom. The point is immersed in about 1 c.c. of physiological salt solution for fifteen minutes, to soften the vaccine matter. It is then scraped off with a sterile platinum spatula, and thoroughly agitated to break up the clumps. If a tube, the contents are washed into 1 c.c. of salt solution.

Five drops of the emulsion are placed in the first plate, ten drops in the second and the remainder in the third, and then these are flooded with agar. The plates are incubated for three days at 37° C., and then at room temperature for two days, after which a count of colonies is made.

After the counts are made the different plates are carefully gone over, especial attention being paid to cocci, molds, streptothrices, and any unusual-appearing colonies. Practice has enabled those making the examinations to detect immediately the presence of unusual colonies. Of course the number of bacteria is not nearly of so great importance as the kind. One tetanus spore or a few virulent pus cocci would be far more serious than countless numbers of subtilis spores.

The entire contents of eight tubes or eight points are planted in 100 c.c. of freshly prepared and recently boiled glucose-bouillon, and grown at 37° C. At the end of forty-eight hours 1 c.c. per 1,000 grams of rabbit of the top growth is inoculated into the peritoneal cavity. If the rabbit sickens or dies, an effort is made to determine the cause. At the end of seven days the remainder of the bouillon growth is filtered through porcelain, and .2 c.c. of the filtrate is inoculated subcutaneously into a mouse to determine the presence or absence of tetanus toxin. This method we believe to be a simple and sure one for the determination of tetanus contamination.

Cultures of cocci and certain other organisms are made from the plates, and their pathogenicity determined by animal inoculation. Within the past year streptococci have been found on but rare occasions. Seldom has a virulent staphylococcus been found. Streptothrices have been found in the product of almost every manufacturer, though not virulent for laboratory animals. No evidence of tetanus has been found in any vaccine examined in the laboratory.

The product is finally tested for potency by primary vaccination upon children, using two tubes or points taken from packages the remainder of which have been examined bacteriologically. The case is kept under daily observation and special attention is given to the character of the "takes." If any faults are discovered, especially bacteriological contamination of a serious nature or a lack of potency, the facts are reported to the surgeon-general, who calls the attention of the manufacturer to the same.

EXPERIMENT AND EXPERIENCE IN THE PRODUCTION OF ANIMAL VACCINE.

By Dr. W. F. ELGIN, Glenolden, Pa.

COLD.

At a meeting of this Association in Indianapolis in 1900, I read a paper entitled "The Influence of Temperature on Vaccine Virus." Attention was called to some experiments that had been made with the various preparations of vaccine stored at different temperatures for six months or longer.

As pointed out at that time, results seemed to indicate that vaccine exposed to cold, below freezing, retains its activity much longer than when stored at a higher temperature. It was also noted that cold delayed the destruction of the contained bacteria.

About the beginning of the year 1904, it was determined to retest samples of the same virus which was employed in the former experiments. Vaccines No. 124, 126, 128, 134, and 138 D, remaining unused in the fall of 1900, had been stored below freezing.

In February, 1904, they were taken from cold storage and placed in an ice cabinet at the laboratory at a temperature of from 8 to 10 degrees C. On March 16th, they were transferred to room temperature at from 16 to 27 degrees C. It being thought that the room temperature would more nearly approximate the conditions probably encountered after shipment.

Weekly tests on calves were made to determine the time limit of the activity of the various samples under these conditions, and at the same time agar plates were made to ascertain the number and character of the contained germ life. These tests proved the virus active until April 30th, the date of the last test, at which time the material was exhausted.

An inspection of the agar plates showed a large number of bacteria present when removed from cold storage, (Feb. 19, 1904, vaccine No. 138 D, showed 12,700 colonies per cc., mostly staphylococcus aureus.) These were rapidly destroyed, particularly when the virus was subjected to room temperature and practically all eliminated in two months.

A 24 hour broth culture of this staphylococcus when inoculated intravenously into a rabbit showed the organism virulent at the time the virus was removed from cold storage. These results appeared to warrant a further and more careful investigation along this line.

Larger quantities of glycerinated virus were therefore placed at 12° C. to be removed in varying lengths of time and to be subjected to conditions simulating as nearly as possible, those encountered in the routine disposition of vaccine virus in commercial use.

Time does not permit of a detailed description of these experiments which are in fact not yet completed, but enough data has been collected during the past year to apparently warrant a statement of the facts:

First. That virus exposed to cold below 0° C, may remain active for an indefinite period, certainly for several years.

Second. That when it is removed from cold storage, it will retain its activity for a considerable period under conditions that usually obtain commercially.

Third. That when glycerinated lymph is exposed to 0° C or below the destruction of the germ life through the action of the glycerin is practically at a standstill.

Fourth. The rapidity of the elimination of the contained bacteria depends upon the temperature above 10° C, in which the virus is stored.

DATING OF VACCINE.

On August 21st, 1903, regulations governing the sale of vaccine, etc., went into effect under the direction of the general government. One of the requirements under the law was that vaccines, etc., should not be offered for sale unless "the date beyond which the contents cannot be expected to yield their specific results is plainly marked on the package."

In order to approximately determine this at different seasons of the year, a small quantity of each routine lot of virus was put aside and tested from time to time on calves until a deterioration was noted.

From January to and including October 1904, 127 lots of vaccine were examined, representing commercial virus to the amount of probably 1,500,000 vaccinations. Upon averaging results, we get the following table:

Month.	Number Vaccines.	Average Time to Deterioration.	Average Length Dating.
January	12	98 days	98 days
February	13	91 days	95 days
March	11	70 days	83 days
April	12	82 days	100 days
May	13	84 days	83 days
June	10	60 days	63 days
July	9	38 days	64 days
August	15	32 days	62 days
September	19	25 days	63 days
October	13	65 days	66 days

From this table it will be seen that the life of the average commercial vaccine is only three months in winter and in August and September only about one month. So that only a slight margin of activity remains in summer when it is retained in the laboratory for bacterial tests. Two lessons may be learned from this:

First. Do not vaccinate in summer season unless compelled to do so by the presence of smallpox.

Second. When compelled to vaccinate at this season order direct from the laboratory and use at once without regard to the dating on the package.

FORMS OF PREPARING VACCINE.

The relative life of the various forms of the virus found in the market has recently been the subject of discussion in the medical journals and elsewhere. Emphatic claims are made that the dried points in particular are to be preferred from the standpoint of reliability.

To determine this point a number of experiments were made in which material was taken from the same calf and subjected to the following treatment:

(1). Top crust was dried in an air blast to represent the dried vaccine in bulk.

(2). Top crust was glycerinated according to the usual formula.

(3). Glass points were charged in the usual way.

(4). Ivory points were charged in the usual way.

(5). Normal glycerinated virus was prepared.

(6). The base of the vesicles was again scraped for a deep layer, giving a bloody pulp which was glycerinated by the usual formula.

(7). Bloody serum exuding from the broken capillaries and containing no appreciable solid material was collected and treated with equal parts of glycerin.

With this material tests were made a number of times with the following results:

(1). Dried crust showed "poor" from the first test which was made two days after removal.

(2). Glycerinated crust was good for two months after removal or until last test.

(3). Glass point showed good take for one month after removal.

(4.) Ivory points showed only a medium development of vesicles on any of the tests.

(5). Normal glycerinated vaccine showed good take for six weeks when the sample was exhausted.

(6). Deep curetting gave an extra good take to the last test, two months after removal.

(7). Glycerinated serum showed a poor take in three weeks, and was unreliable throughout.

From this it would appear that:

First. Dried vaccine in any form is short-lived, and not near so reliable as the glycerinated form.

Second. That the most active virus is to be obtained from the deep curetting.

BACTERIA.

The use of glycerinated vaccine was largely popularized in the United States and Great Britain by the various publications of Monckton Copeman since 1891 to and including the Milroy lectures in 1898. Glycerinated vaccine had been used by Schultz of Berlin, Chambon and Menard of Paris, and Leoni in Italy for over twenty years prior to this ; but as a preservative of vaccine rather than a purifier, though Leoni claims priority to the discovery of its germ-destroying activity through a publication in 1890.*

Copeman's work led us to believe:

First. That after about four weeks' storage in glycerin, the virus is practically free of germ life, as shown by the plate cultures.

Second. That the activity and reliability of the virus was increased rather than diminished; in that the vesicles resulting from this lymph are more nearly typical and uniform.

A very extensive use of glycerinated vaccine in this country soon demonstrated the fact that vaccine held in the laboratory of the producer until bacteria free is conspicuously unreliable as to activity, particularly in the heat of summer. This procedure was therefore impracticable.

The question of the pathogenicity of the contained germs was then considered. The cocci present was isolated by the plate method, and tested intravenously in rabbits through twenty-four-hour broth cultures.

A large number of routine tests, extending over two years, appears to place the pathogenicity of these organisms when isolated from glycerinated vaccine as follows: 44½ per cent. of vaccines show pathogenic germs present the first week, 25 per cent. the second week, 14 per cent. the third week, and 3 per cent. the fourth week. Some very few continued virulent for a number of weeks. The staphylococci from one number promptly killed rabbits after thirteen weeks, when the test was discontinued.

These and other experiments certainly demonstrate the pathogenicity of these organisms to rabbits. Whether they are to human beings or not, we have had no means of determining.

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*Review of Hygiene and Public Health, August, 1890.

A report of the German commission, composed of Schmitman, Koch, Pfeiffer, Frosch, Freyer, Schultz and Varselow, published by Frosch in 1896, states that virus containing staphylococci and virus free of the same, tested on the same children, showed no evidence of an increased inflammation where the infected virus was used.

None of the German stations recently visited make any routine germ tests of the vaccine. Calmette of Lille stated to me that he considered bacteriological tests useless and incapable of supplying any indication concerning virulence of vaccine. In fact, Dr. Blaxall, of the London Local Government Board laboratory, seems to be the only director of the European establishments visited, who laid stress on the bacteriological side of the question.

Since, however, there is a possibility of complications following vaccination, due to contaminations, efforts have been made looking to the chemical purification of the virus.

Numerous experiments have been made with carbolic acid according to the Japanese method published by Umeno, from Kitasato's laboratory, with the result that the virus may be cleared of non-sporeforming bacteria in from four to ten days or longer, according to the temperature to which it is exposed, where one per cent. carbolic acid is used in the mixture.

The activity of this, however, is uncertain and in some instances, while continuing active for several months in the laboratory, reports show that some of the same material that had been shipped was inert.

Chloroform. Dr. Greene of Blaxall's laboratory, London, reported experiments with chloroform, which seemed to promise success. I followed his published reports and directions in private letters with some care, and found that the cocci could be promptly destroyed in less than one hour's exposure; but that, frequently for no apparent reason, the vitality of the virus was impaired so as to render it practically worthless. In other instances, it remained active for months.

Other chemicals have been used by experimenters, but with little promise of success, and at the present time nothing seems likely to supersede the glycerinated vaccine for general use over a large territory.

You have observed that the foregoing experiments tend to the elucidation of two problems: purity and potency of the vaccine, and you have noted how intimately they are associated.

Experience has demonstrated that absolute or even relative purity associated with reliable activity under the conditions that obtain in the United States is a physical impossibility. It appears to me that bacteriologists in this country have largely directed their investigations toward the bacteriological rather than the physiological side of the question. The practical health officer is more interested in the reliability of the virus when combatting a smallpox epidemic. Many victims have gone to the smallpox hospital, and some to an untimely grave, who would have been saved had the virus been reliable and conferred the anticipated protection when used on exposed cases.

This brings us to these acute questions for your consideration:

First. How far are we justified in allowing this purification through the action of the glycerin to go before issuing the virus, or in other words, how far is it justifiable to sacrifice potency to purity?

Second. What are the dangers of so-called "green" virus, and what reliable evidence have we that such dangers actually exist to the extent commonly supposed?

Third. What is the influence of summer heat both on the production and shipment of vaccine, and how will this modify our methods of procedure under such conditions?

These questions are of vital importance both to health officer and producer and are probably impossible of solution by either, alone. It would seem, therefore, to arrive at some conclusion which would be of value, that a commission of all the factors to the problem, and rich in experience gained by direct contact with each phase of it, should be appointed by this Association. A report by such a commission, backed by the authority of this body, would at least go far toward harmonizing what now appear to be conflicting and impossible conditions.

ON THE NECESSITY OF VACCINATION AND REVACCINATION OF INDIVIDUALS WHO HAVE SUFFERED FROM SMALLPOX.

By Dr. VICENTE de la GUARDIA, Havana, Cuba.

In most countries nowadays, as a general rule, there is no vaccination requirement for individuals who have had smallpox. As it is known, smallpox may reinfect once or more the same individual.

I have had the opportunity of vaccinating and revaccinating 1,599 persons, members of the police department, custom-house inspection, port policemen, persons confined in jails (males and females), and at "Las Animas" hospital; of all these, 328 were branded with the smallpox trade-mark, and 47 of whom were vaccinated for the first time in their life, 17 were successful in the taking.

Two hundred and sixty-three were revaccinated, 48 of whom took successfully, giving a total of 65 successful vaccinations.

The total result on the 328 who had had smallpox previously corresponds approximately to over 20 per cent. of the total figures.

Based on these figures, I believe we should insist that as a general rule all individuals, whether they be ex-victims of smallpox or not, should be vaccinated or revaccinated as the case may be.

	Vaccinated.						Revaccinated.				General Total.			
	Total.	Smallpox Before.	Successful.	Unsuccessful.	Unknown.	Total.	Successful.	Unsuccessful.	Unknown.	Total.	Successful.	Unsuccessful.	Unknown.	Total.
Police	751	114	8	3	1	12	9	42	51	102	17	45	52	114
Port	219	24	3	....	..	3	15	....	6	21	18	....	6	24
Jail (male)	491	160	6	26	..	32	21	107	...	128	24	133	...	160
Jail (female)	37	12	...	...	..	...	2	10	...	12	2	10	...	12
"Las Animas" Hosp. (1st time)	64	9	...	...	..	...	...	9	...	....	...	9	...	9
"Las Animas" Hosp. (2nd time)	37	9	...	...	..	...	1	8	...	....	1	8	...	9
Total	1,599	328	17	29	1	47	48	176	57	263	65	205	58	328

NEW FACTS THAT TEND TO DEMONSTRATE THE SUPERIORITY OF HUMANIZED OVER ANIMAL VACCINE, FOR THE PROPHYLAXIS OF SMALLPOX.

By Dr. F. P. BERNALDEZ, Mexico City, Mexico.

In two previous papers I have shown to this American Public Health Association the advantages which are obtained by the use of humanized vaccine in the prophylaxis of smallpox, when administered in place of vaccine from the cow or any other animal. In one of these papers I showed that humanized vaccine is superior to that from the cow, for the reasons that I will remind you of in a few words, before proceeding to set forth the fresh observations which tend to further demonstrate the superiority of the former over the latter.

In the paper I refer to, I stated that after having preserved for a century the humanized vaccine, as utilized by the discoverer, Jenner, we have been convinced in Mexico that the immunity conferred by it is permanent; that is to say, that it lasts for life, whilst the use of the animal vaccine renders it absolutely necessary to revaccinate the individual after a period of ten or perhaps fifteen years; that the degree of immunity conferred by humanized vaccine is much higher than that given by animal vaccine; that is to say, that the person who is vaccinated with cow's lymph is exposed to varioloid infection whenever he finds himself in a focus of this disease, an infection that may assume all the characteristics of confluent smallpox, and that nevertheless, in those persons who have been vaccinated with human vaccine, a very rare event, assumes a mild form of infection; that is to say, of varioloids, that never of themselves bring about the death of the patient.

It is the object of the present paper to prove the above proposition by a statement of new facts, and in order not to make it too long, I shall confine it to the principal points.

During the month of January of last year, an epidemic of smallpox broke out, through some isolated cases, in the city of Torreon, that during the following month of February reached a new development. The spread of the disease was so rapid that in a few days the number of cases amounted to 259. Alarmed by the great spread of the epidemic, the local authorities solicited the assistance of the Supreme Board of Health in the City of Mexico, and, complying with their petition, this board sent two delegates to immediately put in practice the instructions which they received. Amongst these the principal one required the administration of humanized vaccine to all persons who had not been vaccinated, and the revaccination of those who had originally been vaccinated with animal vaccine.

This measure, assisted by the isolation of the sick in lazarettes and the disinfection of the dwellings in which sick persons had been found, brought about the end of the epidemic within three weeks, so that not a single case was afterwards observed.

From the report which these delegates rendered to the board, it was discovered that when the first cases of smallpox were observed, in the month of January, the local physicians commenced to administer vaccine preserved in glycerine, which had been forwarded from the United States; but without obtaining any favorable results, seeing that the epidemic continued to spread, without this vaccine appearing to exercise any influence.

Within the space of three weeks the delegates vaccinated 4,222 persons and revaccinated 94, of whom 63 had been originally vaccinated with humanized lymph and 31 with cow lymph; in the former class, the revaccination only took effect on one person, and in the latter class on 24.

As can be seen from the last figures, we have good proof of the urgent necessity of revaccinating all persons who have already undergone that operation with glycerine-preserved cow lymph, whenever an epidemic of smallpox appears; because, from the moment that the revaccination takes effect upon a person it is a proof that his system was in a condition to receive the infection. On the other hand, as we have just seen, the persons who are vaccinated or revaccinated with humanized lymph enjoy a much longer immunity that, according to our observations, is for life, as in Mexico we have never seen a case of any person so vaccinated being attacked by smallpox, and our practice has also taught us that in such persons the revaccination does not take, or at the utmost assumes the appearance of false vaccination, thus proving that the individual was not susceptible.

For all these reasons, recommendations have been sent to the consul of the different nations, by means of circulars, in which the Supreme Board of Health advises them to get their countrymen to be revaccinated with humanized lymph, which is the only one used in Mexico.

In the epidemic I have above referred to, a case was seen, and not by any means the only one, in which a well known person of the locality, previously vaccinated with cow lymph, refused to be revaccinated with humanized lymph and was attacked by confluent smallpox, of which he died. This example served to induce the persons who had been vaccinated with cow lymph to submit to revaccination with humanized lymph.

On the other hand, not a single person who was in due time vaccinated or revaccinated with humanized lymph was attacked by confluent smallpox. For the purpose of administering these vaccinations and revaccinations, the Supreme Board of Health shipped 730 tubes of humanized lymph to Torreon.

It is true that this lymph, as applied in arm-to-arm vaccination, has been accused of transmitting other diseases by inoculation, and especially syphilis; but I have already explained, in a paper which I read before this Association in the city of Indianapolis, that there is no reason for any such fear provided that certain precautions are taken, and I now propose to present a rapid summary showing what they are.

The child from whom the vaccine is taken for the purpose of direct inoculation must be carefully examined by the physician, so as to know the exact condition of his health; he must be over four months old, as it is well known by all specialists in syphilis that at that age, if no syphilitic symptoms have been discovered, the child is free from the disease; the health antecedents of his parents are investigated; care is taken that the vaccine pustule has not required more than seven days in its evolution, because it has been perfectly demonstrated that the period of incubation of the primary stages of syphilis requires nine days, so that even though the lymph should be taken from the pustule of a child who has unfortunately been inoculated with that disease before the nine days the transmission is confined to the vaccine and does not carry with it the syphilis. On the other hand, if the pustule assumes a syphilitic aspect, it would be superimposed on an indurated tissue such as is found in a syphilitic chancre, and these lesions are easily recognized, so that the lymph of that child is not utilized.

It is also necessary to take the precaution in making the scarifications of the vaccine pustules to allow no blood to run together with the lymph, because in the opinion of some authors it is the blood and not the lymph that produces the syphilitic inoculation.

And lastly, this slight operation must always be practiced by physicians of experience in that branch, in order to avoid all possibility of any such transmission.

YELLOW FEVER IN MEXICO.

By Dr. EDUARDO LICEAGA, Mexico, Mexico.

Every since the year 1893, I have imposed on myself the duty of presenting every year, a report on the course followed by yellow fever in the Mexican Republic, and I now come to give an account of the epidemic that raged during the past year and of the cases that have been observed during the past year in different parts of the Isthmus of Tehuantepec, in Mérida and in Vera Cruz, after which I will present a brief summary of the measures adopted during the past years to stamp out the epidemic and those that have since been carried out in order to finally rid our territory of this disease.

In order to carry out intentions with regard to the first point, I have the honor to present the diagrams which represent the cases observed and mortality through yellow fever in the different points where the epidemic prevailed during the past year. I must first state that these diagrams do not represent the exact number of cases, because in this epidemic as in any other disease that attacks the people in general, the first cases pass unobserved. As regards the mortality, it is probable that the diagrams approached nearer to the truth, because no burials can be made without the permission of the civil registrar of each locality, and although some of the fatal cases may be hidden through ignorance or malice, their number is very small and exercises no perceptible influence on the aggregate figures.

Another diagram also represents the cases and mortality from yellow fever up to the 30th of November last. As a commentary on the former, I must state that it was an entirely exceptional event for the disease to have spread so far from the coast where the original focus of the endemia is found, but on this occasion it followed the road through Tampico to Victoria, Linares, Monterey, Nuevo Laredo, (Tamaulipas) and as far as Laredo, Texas, making short incursions to Lampasos and Monclova, outside of the main line, besides which it committed its ravages in the towns and villages near the cities that I have mentioned. From the other foci, Vera Cruz and Mérida, the disease spread to Coatzacoalcos, to a small town called Jáltipam, to Tehauntepec and to Salina Cruz.

Since the close of the past year, it has completely disappeared from Laredo, Tamaulipas, as well as from all the towns above mentioned in the north of the Republic. The epidemic also disappeared from Vera Cruz, and only a few sporadic cases have been observed in the fortress of Ulúa, which is situated a short distance in front of the town. In Mérida there is no epidemic but a few sporadic cases are observed from time to time, and the same thing may be said of the Isthmus of Tehuantepec, with exception of the village of Texistepec, where an epidemic broke out that is now fairly under control.

With the above statement, I believe that I have fulfilled my voluntary engagement, to declare before this meeting, the status of the yellow fever in the Mexican Republic.

I would very much like to be able to present a detailed report of the efforts, that since the year 1902 have been made in the Mexican Republic to combat the yellow fever and to procure its entire disappearance from the country; but such a study would extend this paper too far, and I, therefore, prefer to relate what was done last year for the purpose of preventing the spread of the epidemic and the measures that have since been adopted and are still being adopted, to obtain the final disappearance of yellow fever from our territory.

The doctrine of the transmission of yellow fever by means of the mosquito is perfectly known to all present, because it was in this city where Dr. Carlos Finlay—whose name will go forever united with true greatness of progress achieved by the prophylaxis of yellow fever, because it was here where the eminent savant stated for the first time, that this disease was transmitted by a mosquito, because it was in this same association that Dr. Reed, the immortal author of the scientific method of demonstrating it by experiments, which will always be remembered in the history of science, first presented it; but I find myself under the necessity of reminding you of the cardinal points of that doctrine, because the sanitary authorities of Mexico have made use of them in planning out their campaign against yellow fever.

Before yellow fever can exist, it requires a combination of the following three circumstances:

1. That there shall be a yellow fever patient.
2. That a mosquito of the genus *Stegomyia* shall exist, and that one of these mosquitoes stings the yellow fever patient, and
3. That some non-immune should be stung by the infected mosquito and so inoculated with the disease.

The problem of the prophylaxis of the disease is therefore reduced to the separation of these three factors. In fact, if there is no yellow fever patient, the mosquitoes cannot be infected; if there are no infected mosquitoes the disease cannot be transmitted, and if there are no non-immunes, there is nobody left to whom the disease can be transmitted.

As up to the present moment no serum has been discovered to give immunity against yellow fever, we cannot convert into immunes, those people who have not already been attacked by the disease. It is therefore impossible in practice to eliminate this factor; but it certainly is within our power to keep up our knowledge of it, and I will explain the methods we have adopted in Mexico to obtain this result. In every town that has been visited by yellow fever, an exact list is made of all the non-immunes, taking their names, sex, age, previous residence, time they have resided in the locality that is already infected or may be infected, and exact data with regard to their present residence. having obtained this information, we have established a staff in each locality that daily makes a house to house inspection. Whenever one of these sanitary agents discovers that a non-immune presents symptoms of fever, he makes no attempt to investigate the origin of that fever, but immediately isolates the affected person, and this isolation is kept up if the observation shows that it is a case of yellow fever, but should it be found to be a case of some other feverish disease, the patient is granted his liberty.

We now come to the other two factors, the yellow fever patient, and the *Stegomyia* mosquito, that is capable of transmitting the disease.

The yellow fever patient cannot transmit the disease through his breath, his excreta, the articles of clothing that he may have soiled, or the air that surrounds him; he only becomes dangerous in the event of his being stung by a *Stegomyia* mosquito, and therefore the method of isolating him only requires that the mosquitoes which might sting him should be prevented from doing so. This isolation is carried out by placing the patient in a room whose windows are provided with a wire gauze that is sufficiently close to prevent the passage of any mosquitoes, and with double doors, each of which must also be provided with wire gauze, separated by a distance of one metre and arranged in such manner that when the outer door is opened the inner one is necessarily closed, and that in order to open the latter, the outer door must necessarily be closed. This is managed by means of a chain of a fixed length which connects the two doors. A room protected in this manner realizes the ideal isolation of a yellow fever patient.

The house to house visits, to which I have already referred, facilitate the discovery from the very first day, of any person suspected of suffering from yellow fever. The agent who discovers a sick man, at once has him carried to the civil hospital, if he is a poor man, to the military hospital if he belongs to the army, and to a special infirmary, if he is able to pay for his attendance.

We thus find the second problem resolved which consists in the isolation of the yellow fever patient.

Let us now study the third point. Before the patient was discovered he may have been stung by a *Stegomyia* mosquito, but as experience has shown us that these mosquitoes continue to live in the house in which they have already stung the patient, it will only be necessary to destroy them within that house to insure their not stinging any person who is non-immune. Experiments have shown us the special method of proceeding in order to destroy the mosquitoes within a dwelling, a railroad or a Pullman car.

The experiments that have been made with the greatest care in the laboratories of the Board, and of which a report will be presented in full detail by Dr. Fernando Lopez, a member of the same Board, have shown us that the combustion of sulphur in certain proportions, infallibly produces death to the mosqito; but it has also introduced into technique of the disinfection, an infallible method for ascertaining whether this operation has really been effective. This infallible method consists in always placing some mosquitoes as "witnesses" in the same place in which the disinfection is to be made, at some point where they might be least exposed to the action of the sulphurous vapors. If under these unfavorable conditions, it is found on completing the disinfection, that the mosquitoes which have served as "witnesses" have died, there can be no question that all which may have existed in the same room, under more favorable conditions for receiving the sulphurous acid, must also have died.

In a great number of towns and villages of the Republic, and precisely in those where the yellow fever spread, the dwelling houses of the poor people are mere huts that are constructed out of materials which furnish an easy entrance and outlet to the mosquitoes and the greater part of them have roofs made of grass or dry branches of some kind. It appeared impossible to disinfect these huts (called in our country "jacales"), but a series of continuous and persevering experiments led Dr. Narcisco del Rio to a satisfactory solution of the problem. I must here detain you for a moment whilst I explain the difficulty of finding an effective method.

Experience has taught us that when an apparatus is placed inside of a dwelling for the purpose of burning sulphur, as soon as it begins to throw off the sulphurous acid the mosquitoes try to find an outlet and direct their flight to any aperture through which light penetrates, even though it may be only the lock of a door, and in this way they leave the room or house without having come under the action of the gases that ought to kill them. As the huts I have referred to inevitably present a great number of openings, the infected mosquitoes escape, and are thus free to proceed to other parts and to transmit the infection to non-immunes. Dr. del Rio decided to cover these huts so completely that no mosquito could escape, and for that purpose he had strips made of a coarse cotton cloth, with which he covers the sides of the hut. These strips reach up to the eaves, and as the roof slopes and projects over the wall the strip of cloth follows the shape of the under face of the roof, is prolonged over the upper face up to the ridge and down the other side, where it again follows the shape of the eaves and continues down the wall till it is pegged down to the ground. Over the strip already laid, and forming a continuation of the same, another strip is stretched and so on successively until the entire hut is covered. In order to completely cover the front and back of the hut, the cloth is sewed in such a manner as to adhere closely to the first strip laid, and thus the hut becomes perfectly well closed as if built of lumber or stone.

As this description may not give you a very exact idea of the method of proceeding, I present two models of huts showing the way in which they are covered.

This proceeding may appear very complicated and capable of substitution by means of a ready-prepared cover, which would be placed over the hut and cover it entirely. Well, this proceeding was not found very effective, because between the walls and roof on the one side and the cover on the other there was a sufficient space left within which the mosquitoes could find a refuge and place themselves beyond the reach of the sulphurous vapors.

If, therefore, we have means of converting all kinds of dwellings, in which mosquitoes might exist into hermetically closed rooms, we have all the necessary elements to carry out a perfect and efficient disinfection in any town and in any kind of dwelling. We have, therefore, solved the third problem propounded, that of separating the three elements that lend themselves to the propagation of yellow fever.

But I do not wish to pass over another method which has been practiced in Havana, and which we have been utilizing for the last year and a half, and which consists in diminishing the number of mosquitoes existing in any given locality.

Natural history teaches us that the *Stegomyia* mosquitoes deposit their eggs in clean water tanks or cisterns, naturally preferring those of the dwellings in which they themselves live, and that if they do not find any such cisterns there they issue to look for water in the ponds that may accidentally be formed through the rains in the public highways, in the hollows that may be formed by the hoofs of the animals, in the tanks, swamps, etc. In order to obtain the disappearance of these last, canalization is preferable, but if this cannot for some reason be carried out it becomes necessary to have recourse to the spreading of a thin layer of petroleum on the surface of the water, for the double purpose of preventing the larvæ of the mosquitoes from coming to the surface to breathe the air, and of killing them by suffocation as well as by the toxic effect of the oil. This method has been everywhere accepted, and we continue to make use of it.

Having set forth the doctrine which has served as a basis for the adoption of the measures that are best adapted for preventing the spread of yellow fever, I will now proceed to describe the methods that we have adopted in our service, in order to give practical effect to the theory.

Our sanitary organization is different to that of the United States. In Mexico we have the Supreme Board of Health, a federal body, whose action is not only exercised in the Federal District but in all the ports and frontiers of the republic in such manner that it can take action in all those places and there establish a service that depends on the central administration. The Supreme Board of Health studies the problems, discusses the methods for solving them, forms a plan of action on which it consults the Federal Executive, and once it is approved by the latter, through the Department of the Interior, it is carried into practice by placing it in the hands of the respective committee of the board, so that the execution of such plan is always kept in the hands and under the inspection of the board itself, with a general vigilance and oversight of the Department of the Interior.

But as this action, however extensive it may be, does not go beyond the ports and frontier towns, without possessing jurisdiction in the different states which are independent and sovereign as in the American Union, the federal entities which were interested in giving uniformity to the efforts against yellow fever requested the Federal Executive to confide the direction of the campaign within their own territories to the Supreme Board of Health. This procedure was adopted by the states of Tamaulipas, Nuevo Leon, San Luis Potosi, Vera Cruz, Chiapas, Oaxaca, Tabasco, Campeche and Yucatan; that is to say, all those that are situated on the coast of the Gulf of Mexico and on part of the northern frontier with the United States. With his support, the Federal Executive has found that it held in its hand the possibility of enforcing prompt and efficient action through the federal sanitary authorities in all those places that had been invaded by yellow fever during the past years.

In order to render the campaign practicable, the Chamber of Deputies last year appropriated a sum of $100,000; in June of the present year a further sum of $40,000, and in the month of November last another of $70,000, making a total of $210,000. The interested states, on their side contributed a sum of $17,000, and the states of Vera Cruz and Yućatan have contributed the half of the expenses incurred in the campaign against yellow fever.

The Supreme Board of Health finding itself thus supported with sufficient authority and the necessary resources, proceeded to form an expeditionary brigade, composed of a physician who was well versed in the doctrine of the transmission of yellow fever and in the methods which the American government had adopted in the island of Cuba (methods that permitted the final extermination in that territory), and with a staff of sanitary agents who had been instructed in Vera Cruz in the different operations of house-to-house visits, isolation of the sick, disinfection of dwellings, and destruction of larvæ. This brigade traveled from town to town of those that had been invaded by yellow fever, and in each one established the sanitary service, training a staff that should in each locality continue the work in the same manner as in Vera Cruz, and follow up the campaign against yellow fever.

As all the services so organized remained under the direct control of the Supreme Board of Health in Mexico, this body was able to receive daily reports by telegraph of every case of the disease that was confirmed or that was suspected, and that was discovered in any locality, and it could also immediately send orders by wire for the steps to be taken to counteract the evil wherever it was found.

This is the method that has been followed, and that will be continued until we obtain the total disappearance of the yellow fever.

But the summary of the results obtained can be concentrated in the following few words:

Yellow fever has been permanently stamped out in Nuevo Laredo, Lampasos, Monclova, Monterey, Linares, Ciudad Victoria, Tancanhuitz, Ozuluama, Tantoyuca, Huejutla and Tampico, and the reproduction of the disease has been rendered impossible in those places, because care is taken to disinfect the vessels which arrive in Tampico from those places where sporadic cases of the disease are still observed. In Vera Cruz the epidemic disappeared some months ago, and there are only sporadic cases found from time to time, which are at once carefully attended to.

In Progreso the disease no longer exists.

In Mérida there are only a few sporadic cases found, but in the last-mentioned three towns the sanitary labors are continued with the same activity as when the full epidemic prevailed.

We may therefore state that yellow fever has been now reduced to certain towns on the Isthmus of Tehuantepec which have railroad connection, and as the attention of the sanitary authorities is now concentrated on those points it is hoped that the disease will entirely disappear from them before the ensuing summer.

EXPERIMENTAL STUDY ON THE ACCLIMATION OF THE STEGOMYIA FASCIATA MOSQUITO IN MEXICO CITY.

By Dr. FERNANDO LOPEZ, Mexico City, Mexico.

Dr. Narcisco del Rio, delegate of the board of health in Vera Cruz, and I agreed upon the importance of studying the growth and conditions under which the yellow fever mosquito, *Stegomyia fasciata,* lives in Mexico City in order to see that if one day it may become acclimated there. This study is one of the greatest importance in order to prove if the altitude, the dampness of the air and the temperature in the Valley of Mexico are compatible with the life of the said insect, for in this case it will not be far distant when the yellow fever may develop in towns which until now have been considered exempt from the said disease.

Until only a few years ago it was admitted that the *Stegomyia* race of mosquitoes could not be found except in some places on the coast! but experience has demonstrated that with the facility and rapidity of communication they have become acclimated in places more or less distant and in more or less elevated altitudes, in this way enlarging the yellow fever zone.

Along the Mexican Railroad, it has been observed that from time to time this disease was spreading, first to Cordova, which has an altitude of 827 meters above the sea level. It did not pass the limits of that station until four years ago when an epidemic broke out in Orizaba (1228 meters above the sea level) and was reported two years later.

Along the Interoceanic Railroad, it has been observed that the *Stegomyia fasciata* has been acclimating itself from station to station, until reached Carrizal station, with an altitude of 827 meters above the sea level. Similar cases have been noted in the states of Tamaulipas and Nuevo Leon, where the traffic of the railroads have facilitated the enlarging of the yellow fever zone.

Having come to an agreement with Dr. Narciso del Rio, I formed the following program for our study.

1st. To investigate if the *Stegomyia* larvae brought to Mexico City would hatch into mosquitoes, and in case they should to see if these would live, if they would bite and reproduce.

2nd. To investigate if the adult mosquito brought from Vera Cruz to Mexico City will live, bite and reproduce.

3rd. To investigate if the mosquitoes infected with yellow fever biting a person in Mexico City, who was non-immune will produce the disease, if it presents the same characteristics which it presents on the coast, and if an immunity may be found.

In order to solve the first part of the problem Dr. Narciso del Rio sent me from Vera Cruz a flask containing a multitude of *Stegomyia* larvae, which were received the 24th day of June of this present year; the larvae were collected from a deposit of water in a house in Vera Cruz and were preserved in the same water.

The said larvae were placed in a fine wire cage 50 c.m. in height, 30 c.m. in length and 40 c.m. wide, having an iron sheeting floor and roof. In one side of the cage there was an opening over which was sewed a cloth bag through which the hand might be put into the cage without fear of letting the mosquitoes escape.

The cage was placed in an ample, well ventilated room where there was sufficient light.

The mosquitoes which began to hatch out in great numbers were fed on bananas, the juice of which they greedily sucked out. Now, when there were quite a number of mosquitoes four or five days old, I put one of my hands into the cage through the opening which I have already mentioned, and with no little surprise saw that the females rushed to it and raising their beaks, something I was not prepared to expect, for owing to the statements which have been admitted heretofore, the *Stegomyia* loses it power of biting when it is found in an altitude of more than 6,000 feet above the sea level, and Mexico City is more than 7,300 feet high. Watching the mosquito you could easily see that its abdomen was filled with blood after which it would retire.

Its sting is painful, forming a pimple which lasts from five to six days and produces an insupportable itching. I repeated this experiment various times, always obtaining the same results.

In order that the mosquitoes might reproduce, I put a bowl of water into the cage which contained some little pebbles barely coming up out of the top of the water, I did this with the object that the females which had sucked the blood might find a place to deposit their eggs. A few days later, I was convinced that this had happened; for using a lens I could see a certain number of isolated eggs upon the surface of the water which were of a blackish color. Then I took this bowl out containing the eggs and put it in another cage in order to observe them better; in ten days time the eggs had been converted into larvae which hatched into mosquitoes, thus constituting the second generation of *Stegomyia* bred and hatched in Mexico City.

Only a few mosquitoes were obtained in this way, for an unlooked for accident overturned the receptacle in which I had placed the larvae unfortunately causing the death of all that remained. These mosquitoes, even when I had put them in conditions which I thought favorable for their reproduction, died without leaving any young. They retained the power of biting as long as they lived, as I proved by exposing my hand to their beak as I had done to the first.

On the 8th day of August of the same year two other flasks containing larvae arrived from Vera Cruz, having been sent by Dr. del Rio. That I might change somewhat the conditions of the former experiment, I put these larvae in wooden cages covered with tarltan. Very soon the mosquitoes began to hatch, and as soon as each one was hatched they were passed over into a new cage of the same kind, in order to observe them minutely. Three days after they were hatched they began to bite. I had then observed friendly struggles between the females and the males.

The first day of September, I observed that there were already many groups of eggs, which were placed inside of a special cage. These eggs were transformed into larvae and the latter into mosquitoes, notnotwithstanding the fact that the temperature had descended to 15 degrees centigrade in the room in which I had placed them for observation. I preserved many larvae until the middle of December, the date in which this was written. From this last generation no eggs were secured, which was probably due to the fact that winter had set in.

The temperature and the degree of dampness of the air in the room in which the mosquitoes were was from the beginning of the experiments taken regularly, and was found to vary between 15 and 21 degrees centigrade for the former; the latter between 50 and 70 degrees.

Having for my object the study of isolated mosquitoes, examples were placed in proof tubes, closing the entrance with a simple gauzy material every day and at different hours of the day I applied the mouth of the tube to the skin of the arm to observe the mosquito while it was biting. With this system I saw that the mosquitoes bite the same at night as in the day and that they do not do it except each three or four days. The mosquitoes remained alive inside the tubes from 24 to 28 days.

Believing it to be very desirable, I will give some experiments which I made in order to determine how long a time the larvae and pupae will live without breathing atmospheric air. I placed some larvae in trial tubes which were completely filled with water,and stopped them up with a rubber, without leaving on the inside the least bubble of atmospheric air. The others I stopped with tarltan and inverted it in a vessel of water so that the atmospheric pressure would always keep it full without permitting a bubble of air on the inside; the tarltan kept the larvae from coming out. Multiplying these experiments, I was able to observe that the larvae lived a longer or less time in proportion to their age, varying from 12 to 50 hours. The pupae averaged from 40 minutes to an hour.

In all of these experiments I observed a very curious phenomenon in the larvae as well as in the pupae, which is the following: As soon as the larva was shut up in the tube it would go to the top and not finding any air to breathe it would descend slowly, curling itself up until it formed a complete circle, it would rub the extremity of its breathing tube with the tufts of filaments which it has on its mouth, with such violence that one would suppose that it was trying to remove some obstacle from it, after this it would make repeated trials continuing this operation until its death.

Owing to its form and brisk movements, the pupae is still more interesting. As soon as it reaches the top of the tube in which it is enclosed and where it finds no air to breathe, it descends slowly, curving its body backwards and with the two flaps at the end of the abdomen eagerly brushes its breathing tubes. It repeats these struggles with less and less energy until its death.

These experiments which I have had the pleasure of describing to this Association, prove that the *Stegomyia fasciata* mosquito can live, bite and breed for at least two generations in Mexico City, notwithstanding the fact that the aforesaid city has an altitude of more than 7,300 feet above the sea level.

The other two parts remain yet to be solved. In the solution of the third great obstacles will have to be overcome, but careful study will be given these problems as soon as the cold weather is over, and in our next meeting, I hope to be able to present the results of my study to this Association.

THE BUBONIC PLAGUE IN THE PORT OF MAZATLAN, STATE OF SINALOA, REPUBLIC OF MEXICO.

BY DR. EDUARDO LICEAGA, MEXICO, MEXICO.

The campaign which the Mexican government undertook against yellow fever in the last six months of 1903, and my official duties on the board of health, were the obstacles that prevented my attending the thirty-first meeting of this Association which was held in Washington, and it is for that reason that I now come to present a report on the epidemic of bubonic plague which was developed in Mazatlan from the end of December, 1902, to May, 1903.

I have thought it necessary to present a report of that epidemic before this Association, even though it may appear somewhat late, because a society that is intended to study public hygiene in all its branches cannot allow an epidemic to pass without notice, that might have been of fatal consequences for the Mexican Republic, and even for the American Union, if it had not been limited to the port of Mazatlan, where it appeared, and to some small villages in the neighborhood of that port. From the point of view of international sanitary police, it is of interest to bring this event to mind, because there is no example of an epidemic of bubonic plague having been confined by the efforts of the authorities to such a small number of towns and finally extinguished in less than six months.

PROBABLE ORIGIN OF THE EPIDEMIC.

Mazatlan is a port situated on the Pacific coast, at 23° 11′ 2″ of north latitude and 7° 17′ 34″ of longitude west of Mexico. It is situated within the torrid zone, and its climate is tropical. It has a population of 25,000 inhabitants.

This port is in frequent communication with that of San Francisco, Cal., in the United States, where for the three previous years the bubonic plague has existed in a central quarter of that city, which is called "Chinatown."

Probably fearing the quarantine restrictions that might be imposed on their trade in foreign ports, the authorities of San Francisco, Cal., had carefully hidden the existence of the disease and were issuing clean bills of health to the ships that sailed from that port.

On the 13th of October, 1902, the steamer "Curaçao" reached Mazatlan with a cargo of goods from China, which were landed in that port. Seven days afterward the first case of the disease was observed, but no diagnosis could be made because the plague had never been seen in the Mexican Republic and its physical symptoms were unknown to the physicians, for which reason it is supposed that the patients were suffering from a rare and malignant form of malaria.

It has been found impossible to discover whether these goods came directly from Chinatown in San Francisco, Cal., or whether they had been trans-shipped to the "Curaçao" from a vessel arriving directly from Asia; but the unquestionable fact is that the ship had sailed from San Francisco and that the cargo contained goods of Chinese origin.

FIRST NOTICE OF THE APPEARANCE OF THE EPIDEMIC.

In the month of December, 1902 the delegates of the Supreme Board of Health in the port of Mazatlan reported by wire that an extraordinary disease had appeared in that city, of which nineteen cases had been observed and eight had terminated fatally, all during the time that elapsed from the 20th of October to the 13th of December; *that the disease was principally characterized by high fever and by the appearance of buboes in the groins, armpit or neck.*

The Supreme Board of Health, which is by law charged with the international sanitary police in the port, had no knowledge during the first days of the month of December of the facts above mentioned, that the steamer "Curaçao" had brought goods of Chinese origin; but bearing in mind the extra-official knowledge it already had of the existence of plague in a ward of San Francisco, Cal., and the fact that the only transmissible disease which is accompanied by high fever and buboes is the plague, ordered its delegate to endorse the bills of health with a statement that a disease existed in the port which was suspected of being bubonic plague. At the same time it addressed the local authorities of Mazatlan and the Governor of the state of Sinaloa, in which the port is situated, urging upon them to take the measures that are provided for under the sanitary code for the extinction of any epidemic disease.

In order to proceed to the orderly enumeration of these measures I will take them apart, and first relate those that were adopted against the disease in order to stamp it out in the place in which it originally appeared; secondly, those that were intended to prevent its propagation by sea; and, thirdly, those that were intended to avoid its transmission by land.

I. MEASURES ADOPTED TO STAMP OUT THE DISEASE IN THE PLACE IN WHICH IT HAD APPEARED.

Orders were sent to the political authorities of Mazatlan to bring before the physicians, heads of families, of workshops, of factories, of schools and colleges, the obligation that is laid upon them under the sanitary code to declare the cases of plague that might come within their knowledge.

The local authorities at once ordered house-to-house visits to be made in order to discover the sick people who might have been hidden by their relatives, and in order to carry this measure into practice the city was divided into wards, and the investigation was put under the charge of physicians, assisted by 125 men of the sanitary police. At the same time, and in compliance with the provisions of the federal sanitary code, the isolation of the patients in a lazaret.

In order to make this isolation entirely effective, the lazaret on the island of Belvedere was arranged and a department established there to receive the undoubted cases of plague, besides another isolated department for persons suspected of having the plague. Another was dedicated to the convalescents, and on the same island they established a series of bath houses, a dispensary and a special dwelling house for the hospital attendants and staff employed in the building.

The easy and safe isolation of the patients was secured by placing the lazaret on an island. At the same time, seeing that those persons who had been attending the patients before they were transported to the lazaret might have received the contagion, an observation camp was established on the heights above the Velodromo, close to the beach and outside of the town. This observation camp consisted of a series of tents intended to lodge the families of the plague sufferers, who were there lodged and fed and kept in observation for ten days, and only allowed to leave the camp if found in good health on the expiration of that term. The poor people were on departing supplied with new clothing and a certain amount of money.

As the poor quarters of the port of Mazatlan are greatly crowded with houses, orders were given to dislodge the surplus inhabitants of each house and to furnish them lodging in tents.

Also in compliance with the sanitary code, orders were given for the disinfection of the houses that had been occupied by the sick people and of the clothing they had made use of. When the latter were found to be of small value they were burned.

In order to carry out the disinfection service in the different quarters of the city, a solution was employed of bichloride of mercury at one per thousand, which was atomized over the roofs, the walls and floors of the dwellings by means of force pumps. When these houses were of slight value, and especially when they could not be disinfected, they were destroyed by fire; 375 houses have disappeared in this manner.

As the epidemic had been preceded by a great mortality among the rats and mice, war was declared against these animals by all the means that are usually employed, amongst which was a virus intended to produce in them an epizootic disease that cannot be transmitted to men.

At the same time, the local authorities ordered a thorough cleaning to be made of all the houses and the streets to be well swept; that the slaughter-houses and markets should be kept scrupulously clean, and all the garbage incinerated.

The circumstance that the plague had never appeared up to that time in the Mexican Republic had rendered it unnecessary to keep any supply of the curative and preservative serums of that disease; but these were at once ordered from the Pasteur Institute, consisting of 1,000 flasks of Yersin's serum and 500 of Haffkine serum, although larger quantities than those mentioned were subsequently consumed.

II. MEASURES TO AVOID THE SPREAD OF THE DISEASE BY SEA.

As above stated, the plague had never before visited the Republic of Mexico. When during 1900 it made a fresh invasion of Europe and of some South American countries, it became necessary to add to the maritime sanitary regulations a special chapter which was intended to protect our ports against such an invasion, as up to that date this disease was not mentioned in the sanitary code because it was thought unnecessary. The additions to Chapter II of the Maritime Sanitary Regulations, which were intended to give protection against the plague, were promulgated on the 30th of May, 1900. Since that date they have remained in force and would have protected us against the disease if the sanitary authorities of San Francisco had not suppressed the notices of the existence of the plague and issued clean bills of health to the vessels which sailed from that port, thus rendering it possible all risk of the disease being imported from Mazatlan.

The first step which the delegate of the board of health in the port of Mazatlan was instructed to take was to endorse the bills of health with the statement *that an epidemic disease had appeared there which was suspected of being the bubonic plague.* This declaration was made not only to protect our own port but also foreign ports against all risk of the disease being imported from Mtzatlan.

The steps that were intended to prevent the spread of the disease by sea can be divided into two groups, (*a*) those that were taken in the port of departure, and (*b*) those that were to be observed in the ports of arrival.

(*a*) A commission of physicians was appointed to issue certificates of health or passports to the persons who came to the port for the purpose of embarking, in this manner preventing any diseased or suspected person from going on board and carrying with him the plague. This commission was charged with the duty of disinfecting the baggage of the passengers and the goods that were shipped, and the sanitary delegate in the port was instructed to carry out the destruction of the rats and mice on board of the ships that were about to sail. These precautions gave a great feeling of security; but in order to still further comply with the provisions of our maritime sanitary regulations and the additions all the delegates in the Pacific ports were again reminded of the rule I am about to refer to.

(*b*) The ports along the Pacific coast are very numerous, and as some of them have no medical delegate, who is the sanitary authority charged with the medical inspection of the ships and the one that has to direct their disinfection, these ports—which are of only slight commercial importance, were closed to all direct traffic from Mazatlan, the only ports left open being those of Guaymas, San Blas, Manzanillo and Acapulco, subject to the legal provisions above mentioned and which can be summarized as follows:

The ships were to lay out in the bay, on a special anchorage that was provided for suspected vessels; the sanitary delegates would then approach the side and give orders for the vessel to be detained ten days, including in these the day on which the vessel left the infected port. The object of this detention was to ascertain that the disease had not developed itself in the person of any passenger or member of the crew. During this period of observation the clothing in use and the passengers baggage were disinfected as well as the cargo contained in the hold and the rats and mice were also destroyed, all by means of sulphurous acid, which was burned in the proportion of 40 grams for every cubic metre of space in the hold, which was left hemetically sealed for twenty-four hours. Meanwhile, the decks of the ship were disinfected with a solution of bichloride of mercury at one per thousand or of carbolic acid at five per cent. Only those articles which were to be disinfected on their surface were treated with formaldehyde vapor. Once all these operations were terminated, and before commencing to discharge, the delegate examined all the goods package by package so as to ascertain that the outside coverings did not carry any rats or mice and that they had no holes. If he found any one of them in this condition, it was to be feared that these animals might have got into the interior of the package, and in that case they were opened so as to ascertain the truth, and the packages placed in such a situation that on issuing the rats would fall into boiling water, from which they would not be extracted except with the aid of forceps. Once taken out, they were covered with petroleum to burn them.

If the ships arrived with sick people on board, or if the plague had developed on board during the ten days of observation, they were sent to the port of Acapulco, where there is a lazaret properly fitted up to receive persons suffering from the plague, cholera or yellow fever.

If the final destination of the vessel was not one of the above-mentioned ports, on the expiration of the ten days' observation and after a proper disinfection the delegate issued to such ships a certificate which stated the above facts and with this document they were allowed to enter any port on the Pacific coast.

In order to facilitate the importation of provisions, disinfecting substances and others that might be required, special permits were issued by the Supreme Board of Health to certain vessels for them to carry those goods to Mazatlan, but without entering the port. In these cases the vessel laid outside of the port and the sanitary delegate went along side in his boat to receive the goods, without permitting the people from shore to communicate with those of the vessel, and then issued a certificate in which all these facts were set forth so that the vessel could return to her port of departure or any other without being subjected to quarantine.

These measures have been so efficient that not a single case of plague was developed on the vessel or carried to any other port during the entire period that the epidemic raged.

III. MEASURES INTENDED TO AVOID THE PROPAGATION OF THE PLAGUE BY LAND.

A most efficacious means for stopping an epidemic is to decrease the number of inhabitants of the town in which it prevails, as in this manner there is a decrease of the element which tends to the propagation of the disease. The public authorities cannot order this except in the case of very small towns; but in the present case the residents of Mazatlan began to leave the place, and it is estimated that as many as 8,000 people did so. But at the same time it is indispensable that, on abandoning a city, the emigrants should not carry the contagion with them, either in their persons or baggage.

A medical commission was appointed to examine the persons who desired to leave Mazatlan; if they were found in good health, a passport was issued to them, which stated their names and surnames, their state of health and place of destination. This commission forwarded similar reports to the authorities of the place to which the emigrants were proceeding, and kept a register of them all.

On the roads leaving Mazatlan (it has no railroad communication as yet for other points in the state of Sinaloa and neighboring states, and on the most frequented passes, sanitary stations were established that consisted of a department for those who arrived with the disease confirmed; another dedicated to the patients who were simply suspected of suffering from the plague; of a third department in which the convalescents were lodged; of a bathing department; of a disinfecting furnace; of a room dedicated to the fumigation of goods by means of sulphurous acid, and lastly of living rooms for the staff.

These stations were under the direction of a hygienist physician.

Besides this, a second zone of sanitary stations was established at a certain distance from the first, and the states that adjoined that of Sinaloa also set up sanitary stations, of which two were in the territory of Tepic, two in the state of Jalisco, three in that of Durango and one in that of Sonora.

The defenses by land were established as follows:

In the first place the medical commission in Mazatlan made an inspection of all persons who attempted to leave the city. If any of the travelers were found sick before the second day on the journey, they would be detained in the first sanitary station; if the disease showed itself between the second and fourth day, they would be detained in the second zone, and if it appeared when the traveler was leaving the state of Sinaloa he would be detained in the stations of the adjoining states; but if even then the incubation was prolonged and the disease showed itself before the tenth day, the traveler was kept under the vigilance of the authorities of the place to which he arrived, as they were previously warned by the medical commission of Mazatlan.

It is estimated that more than 8,000 people left Mazatlan during the first days of the epidemic before all the precautionary measures could be put in force, and it will therefore be understood that many escaped the inspection in Mazatlan and avoided the sanitary stations. This explains how some cases appeared in the three divisions I will refer to later on; but so limited was this number that I do not hesitate to say, that the plague remained concentrated in Mazatlan and that consequently the steps taken to prevent its propagation by land produced the desired result.

PLACES TO WHICH THE EPIDEMIC SPREAD FROM MAZATLAN.

A village of 400 inhabitants called Oso, and situated on the left bank of the Fuerte River, was the first to be attacked as follows: A family left Mazatlan on the 24th of January and on the 27th when they reached the village of Elota, a little girl fell sick. In order to avoid passing through the sanitary station established in this place, the family fled to Oso, where they arrived seven days after. The little girl died there, but spread the contagion to her mother and the latter to the grandmother, so that the two also died. As soon as the fact was reported, a physician was sent from Culiacán, capital of the state of Sinaloa, who was able to prove that the patient whom he found still alive was suffering from the pneumonic form of the plague. The disease attacked still three persons more; but as the whole of the patients and persons attending them were isolated; their clothes and other articles that might have been infected and the houses in which they had dwelt were destroyed by fire; as all the persons who ran any risk of contagion were vaccinated with Yersin serum, which was the only one at that time disposable, and as the rats and mice in the neighboring houses were destroyed, the epidemic was finally stamped out in that place.

I would also note that the village of Oso, which is situated about 170 kilometres from Mazatlan, was the farthest to be reached by the epidemic.

The village of Villa Union, situated 26 kilometres to the southeast of Mazatlan, was invaded by the families who emigrated from the port when the epidemic declared itself, and to this fact as well as to the frequent communication it had with the port, we owe the appearance of another focus, where seven persons were attacked, although only one died. As soon as the first case was observed, physicians, disinfecting furnaces, disinfectors, were sent and measures were taken for isolating the sick, the suspected and the convalescents. As in Mazatlan, an observation tent was established in which to isolate families of the sick people, the houses inhabited by the patients were destroyed, the rats persecuted and the epidemic was stamped out. Two important factors contributed to this result; of which the first was the establishment of a sanitary organization similar to that at Mazatlan, and the second the vaccination with the Besredka vaccine of over 645 persons who were exposed to the danger of taking the disease.

Another village called Siqueros, situated 34 kilometres from Mazatlan, and 15 from Villa Union, received the emigrants from the latter village and with them the disease; but all the same resources that were employed against it in Mazatlan and in Villa Union were utilized in this case, and though nine cases were observed with six deaths, the epidemic was also stamped out in that village.

Before terminating my report of the steps that were taken to prevent the propogation of the epidemic by land, I must mention a plan that efficaciously contributed to prevent the emigration of the sick, and which consisted in the organization of a flying brigade of sanitary police, accompanied by an ambulance and under the direction of a physician, which traveled along the road and visited small villages, exercising thus a most efficacious vigilance.

CONFIRMATION OF THE NATURE OF THE DISEASE.

As we stated at first, the Supreme Board of Health, the federal and the state authorities in Sinaloa, laid down the plan of campaign against the plague, based on the clinical symptoms of the disease; but the scientific conditions demanded that its nature be confirmed by bacteriological proof. For this purpose the board sent Dr. Octaviano Gonzales Fabela, a distinguished bacteriologist of the corporation and provided him with a proper outfit and small animals so that he could carry on his studies by means of the proper experiments. As soon as this doctor reached Mazatlan, he commenced his clinical studies of a patient who was suffering from the pneumonic form of the plague, collecting his sputa and the liquid from the peri-ganglionary tissues of a bubo and was able to prove the existence of the Yersin bacillus. With a pure culture of this bacillus he inoculated some guinea pigs that shortly after presented the characteristics of the disease. On receipt of this diagnosis by wire on the 31st of December, the Supreme Board of Health publicly declared that the epidemic which had spread in the port of Mazatlan, was the bubonic plague, and communicated this fact to the federal authorities of the Republic, of the states, to all the sanitary delegates in the ports, to the sanitary authorities of the United States and to the International Committee of the American Republics, whose headquarters are in Washington.

NUMBER OF CASES AND DEATHS.

The number of cases that were reported to the authorities were 351, and the deaths 296, covering the period from the 13th of December, 1902, up to the 15th of March of 1903. The number of deaths is exact, as under the laws of Mexico, no body can be buried without a certificate from the registry office, giving the cause of the death. The same thing cannot be said as to the number of cases of the disease, as in Mazatlan the same thing happened that has been observed in all parts of the world, which is that many cases are kept secret in order to prevent the patients being taken to the lazaret. The number of these hidden cases was greatly diminished as soon as the house to house visits were arranged and a constant watchfulness was exercised over all the houses in the town. The fear that the poor and ignorant classes have of being taken to the lazaret, induced many unfortunate people to leave the town, and many were collected from the roads and taken to the lazaret. This explains the difference between the cases observed and the deaths.

The largest number of cases observed in any week was 65, and the largest number of deaths 56. The decrease was rapid and marked up to the complete disappearance of the epidemic.

MEASURES INTENDED TO PREVENT THE RE-APPEARANCE OF THE DISEASE.

As we could not say that all danger had passed simply because the epidemic had disappeared, it became indispensably necessary to take the proper measures to prevent its re-appearance. The character of this paper will not allow me to enter into details, and I will confine myself to a relation of the principal steps taken for that purpose.

In the first place, the domiciliary visits were kept up and especially in those houses that were occupied by the first cases, when the nature of the epidemic had not yet been established. These visits were also repeated in the houses that contained patients whose diagnosis was confirmed, and all the houses adjoining these or that were inhabited by persons who came into direct or indirect contact with the victims. In all of these houses, the disinfection was made for the second time and if they were of small value they were in many cases destroyed. The disinfection of the clothing which was found in all of these houses was also repeated and a commencement was made with the clothing that was deposited in the pawn shops. The careful cleaning of the streets was kept up, of the slaughter houses, markets and other meeting places, as well as the destruction of the garbage by fire. Before re-opening the schools which were closed at the commencement of the epidemic, the school-rooms were disinfected, and before allowing religious services to be resumed, the persons who attended these services were required to provide themselves with clean clothing that had previously been disinfected and with a certificate that they had bathed. The destruction of the rats and mice was continued by the merciless war that was carried on against them during the whole period of the epidemic, and a special commission charged with making a bacteriological study of the blood and tissues of these animals as they were caught in the town, has continued its labors for one year and a half since the epidemic terminated and has proved that they are no longer infected with the plague. The medical commission which issued certificates of health to all travelers leaving Mazatlan and which was charged with the disinfection of their clothing and baggage, as well as of the goods shipped out by sea or land, continue in the active exercise of its functions. The sanitary stations that were established around Mazatlan also continued their functions but was an improved service, and over looked not only the passengers and goods that left the town, but also those that arrived on their return after having emigrated during the course of the epidemic.

In the villages in which cases of plague appeared, as I have already mentioned, the same precautions were continued as in Mazatlan.

The extermination of rats was advised, not only in the places that were invaded, but was also carried out in a great number of cities of the Republic, and especially in Culiacán, at a distance of 240 kilometres from Mazatlan where over 35,000 rats had been killed.

In consequence of the above precautions, the plague did not reappear in Mazatlan or any other point in Mexican territory.

RESOURCES EMPLOYED FOR STAMPING OUT THE PLAGUE.

The municipality and district of Mazatlan furnished all the funds that they were able to dispose of for the defense against the plague; but the state of Sinaloa at once came to their assistance by appropriating a sum of $20,000 to cover the first necessities for the moment. The federal government also forwarded $20,000 for the improvement of the conditions of the lazaret and isolation wards, as well as to repair the streets and destroy a sewer that was in bad condition.

The federal government also contributed by sending physicians, medical students, disinfectors, large disinfecting furnaces of the Geneste-Herscher model; a supply of disinfecting substances, sprinklers, etc., and it also established and maintained at its own expense, the sanitary stations above referred to which were situated at more or less considerable distances from the city. It also furnished the Yersin curative serum, as well as the Haffkine and Besredka vaccine. It established a lazaret in the port of Guaymas and perfected and thoroughly fitted up the existing one in Acapulco; sent a physician whose energies were dedicated to the exclusive service of the latter institution, and made provisions in every way necessary for the thorough execution of all the measures that were adopted.

These resources would, nevertheless, have been insufficient to combat the epidemic, as in the port of Mazatlan alone the expense amounted to $3,000 per day in official disbursements.

At the same time, a charity board was organized in the capital of the Republic, that in a few days raised a sum of $100,000, that was promptly remitted to Mazatlan. All the states of the Republic also hastened to send their subscriptions; but in order to organize the collections and utilize the contributions of all the citizens of the Republic, a national commission was formed which collected over $300,000, including the sum above mentioned. It is worthy of note that every one of the inhabitants of the Republic, and especially those who compose the foreign colonies, contributed their mite to alleviate the sufferings of our brethren in Mazatlan. This sum of $300,000, required no sacrifice on the part of the community, but nevertheless was of immense results, not only on account of the number of lives which it saved and the assistance given to the poor, but also because it has served to prevent the epidemic from spreading in our country, where it would have brought about the most horrible disaster, besides ruining its trade and prosperity.

THE ACTUAL SANITARY CONDITIONS IN HAVANA AND THE FURTHER REQUIREMENTS FOR THEIR IMPROVEMENT.

By Dr. ERASTUS WILSON, Havana, Cuba.

The prevailing annual death rate or mortality in the city of Havana previous to the American intervention, 1898-1902, approximated 40 per thousand. The general cleaning up of public places and rigid house to house inspection and abatement of unsanitary domestic conditions, together with filling the puddle holes and irregularities in the macadamized streets, with the prohibiting of the ejection of domestic wastes into the bi-ways, obtained immediate and notable reduction in the mortality, or death rate, in the city.

The continuation of the sanitary measures introduced by that intervention and the continued improvements of the pavements of our streets have reduced our type of mortality and morbility to about 50% of its former rate, besides beautifying our city and making it infinitely more attractive for residents who are interested in health and general culture.

These improvements are worthy indeed of sincere felicitation among all intelligent members of our permanent society, and there are even those who are boastful of our sanitary conditions compared with those of many cities of the United States, as if we have no further improvements to obtain.

The object of this paper is to call attention to a further requirement of sanitary science which is radical and indispensable.

We have indeed washed our municipal face and present a smiling and attractive exterior to our visitors, but our underwear is badly soiled, and is far less presentable. We have as yet no sewers to carry off our excretions out of the city. The few and ill-conditioned permeable gutters that are beneath some of our streets, without system, form or gradation, can by no stretch of imagination be called sewers. They are practically elongated excavations to receive the aqueous overflow from the subterranean receptacles and domestic waste waters which exist beneath the flagstones of most of the interior yards of our houses.

It is a fundamental axiom of sanitary science that humid soils are unhealthy and when humid with solutions of organic wastes from these overflows its toxic conditions are greatly augmented and introduce grave and profound disturbances in the public health.

It is one of the fundamental requisites of sanitary science that all vital excretions and domestic wastes shall be delivered into impermeable closets and sewer pipes and conducted not only outside the domiciles, but completely and entirely outside the city or village within twenty-four hours, or in other words, before putrefactive fermentations begin within them and this without any possible infiltrations into the sub-soil of the streets to thence exhale their noxious miasms into the atmosphere of the streets and domiciles.

In order to meet this requirement a modern system of sewers of proper section regularly graduated in size and declivity from their incipience to outfall, impermeable throughout and connected with the closets of every house by lead-jointed cast-iron pipes, uniting them to the sewer outside the domicile. Here I would accentuate the phrase "proper section," because however impermeable a sewer may be, a square section is inadmissible because of the increased friction which they oppose to the current sewage in the corners, and which surely results in accumulations and obstructions.

The so-called sewers existing in Havana not only have this defect of square section, but also have no graduation of size and declivity. They are not parts of any organized system, but are separate entities with very little or no relation one with the other, and all constructed of permeable bricks and mortar and whenever opened to the surface of the street for repairs the soil about them is found to be discolored and black with putrefying organic filtrations from them.

The nauseous filtrations are even aggravated by what under other conditions would be an unqualified sanitary element, I refer to our excellent water supply. The abundant distribution of this excellent liquid has brought with it the American water closets, without any adequate provision for carrying off the water used in them which consequently goes into the house cesspools and overflows into the aforesaid gutters under our streets thereby greatly exaggerating the humidity of our subsoil by its filtrations into it, contaminated by solutions of the materials from the water closets.

This exposition of our actual conditions appears to indicate the urgent need of the immediate construction in Havana of a modern system of sewers and subsoil drainage. Indeed, during the American intervention though surveys were made and plans for such system were elaborated, under the direction of one of our veteran sanitary engineers, Mr. Samuel M. Gray, of Providence, R. I., as consulting engineer, and the construction was formally awarded to an American company that deposited a half million of dollars in the municipal treasury, as a guarantee of its good faith in its execution. But since the retirement of American intervention no further steps have within my knowledge been taken to carry out this fundamental and indispensable sanitary measure. Moreover, I am unable to say if there still exists a persistent purpose in our political authorities to do so.

This measure is all the more urgent because all of our domiciles and other buildings are constructed with their lower floors in direct contact with the soil, without cellars or other air-spaces between them and the soil, and almost universally without damp-courses in the foot of the walls to intercept the penetrations of moisture by capilliary attraction within them and this circumstance makes the drainage of our subsoil also an imperative necessity. A resolution of the American Public Health Association recommending the immediate execution of the necessary work for the sewerage and soil drainage of our city might hasten their accomplishment. I move, Mr. President, that a resolution of this import be recorded in the proceedings of this congress of the American Public Health Association.

This indispensable work carried out it would then remain for us to secure legislative enactments organizing a municipal board of health of limited membership, but with ample powers for suppressing nuisances by summary proceedings, without which it will be difficult to enforce by moral suasion alone, sanitary customs that are new and foreign to those in which our public has been heretofore habituated.

If this congress approves the above motion, I think it possible to obtain in the near future the legislation here indicated.

After the sewerage and drainage works have been constructed, then our water distribution could be safely, economically and advantageously increased by duplicating the forty-two inch main, which now conducts all our water from the reservoir to the junction of Reina and Belascoain streets, and thence delivered in the distribution pipes.

Until such works are constructed, the present supply might be elevated to the second floors in all parts of the city and at the same time the humidity in its soil greatly diminished by applying water meters to largest consumers, and by rigid house to house inspection to enforce the closing of faucets when not in use, thereby restricting useless and baneful wastes of water into our subsoil.

During the American intervention, house to house inspection secured water supply to all the second floors. Previous and subsequent to American intervention it was, and is, elevated to second floors by artificial means, and although I estimate the necessary quantity of supply is duplicated by the quantity necessarily running to waste by careless habits and is absorbed into our urban soil, still a considerable portion brought by the aqueduct to the reservoir escapes from the spillway and runs off into the harbor. This excess is now in project to be delivered to supply to the suburb of Guanabacoa.

This too brief exposition of the actual sanitary conditions of Havana, cannot be relinquished without some reference to meteorological influences which greatly favor our locality. The unfailing diurnal and nocturnal sea and land breezes continually waft away from our atmosphere a considerable part of the noxious miasms arising from our polluted soil and thus compensates in some degree for our criminal negligence of the construction of a sewerage system for our city.

HYGIENIC CONDITIONS OF VERA CRUZ; PRESENT AND FUTURE.

By Dr. MANUEL S. IGLESIAS, Vera Cruz, Mexico.

It is not my intention, in this paper, to bring up for discussion the health statistics of the city of Vera Cruz, but I simply desire to give you a knowledge of the present hygienic conditions of that port, and give you a true idea of what now appears so dark as well as of the hopes which we have for the future and the reasons on which we ground those hopes, that at no distant date this important port will be one of the healthiest that can be found.

In support of the above propsition, I suppress the dry part of my studies and will only set forth the conclusions which I have reached in view of official statistics that I have had before me and of the notes taken from the practice of my fellow practitioners, as well as of myself, in our professional work.

These show that in round numbers, out of every hundred deaths, the following are the causes:

Tuberculosis	18
Yellow fever in normal periods	10
Malarial fevers	10
Other general diseases, considered under the Bertillón classification	5
Diseases of the digestive apparatus	18
Diseases of the respiratory organs	8
Diseases of the nervous system	2
Infantile diseases	25
Sundry causes	4
Total	100

If we reflect on the causes of this mortality, we find that tuberculous diseases bear more or less the same proportion to the total mortality as in other parts of the world.

Although it is true that the deaths from yellow fever reach a high figure in some years, in others the number is very low and in still others there are no deaths whatever from it, for which reason the porportion that I have given is for periods which I have called normal, as it is taken as an average, not considering times of epidemic nor those of total absence of the disease, which times can and should be considered as abnormal.

Malaria contributes in no small degree to the mortality; but this disease is a scourge of a great part of the surface of the globe which we inhabit, and is, therefore, not peculiar to Vera Cruz, where it is comparatively mild, as compared with other malarial regions.

The other general diseases contribute only five per cent. to the total mortality, which, distributed between all that constitute this group, really becomes a negligible factor; especially if we consider that some of them, such as typhus, typhoid, diphtheria, smallpox, and other eruptive fevers, that in other towns furnish such a heavy contingent to the death rate, are here so exceptional that years pass without a single case being heard of, and, in the few cases known, their number is very limited.

Typhus and typhoid do not spread in the city, for reasons which at the moment I find difficult to state, and the few cases that are observed are all imported and, up to the present date, have never formed a focus of infection.

The very rare cases of smallpox which are observed, are amongst the element from out of the city, and originate from some neighboring town, as the residents of Vera Cruz are preserved against that disease by the vaccination which is administered on a very large scale and in a manner that is both constant and efficient.

The other eruptive fevers are very rarely found, and when observed, are of such a mild character that a fatal termination is a very rare thing.

The predominance of diseases of the digestive organs, almost entirely pertain as regards their order of frequency to the affections called entero-colitis, gastro-enteritis, dysentery, hepatic cirrhosis and hepatitis, which are the cause of seventeen percent of the mortality, leaving only one percent to the affections that form this group and to complete the eighteen percent with which it figures in the total number of deaths.

The topographical situation of the city of Vera Cruz, induces the belief that the affections of the respiratory organs ought to be rare and the statistics prove it, seeing that the deaths from this cause only amount to eight percent, and these are mostly children and young people, who, by reason of their age, neglect to take the proper precaution and to protect themselves from the sudden changes of temperature, which are the causes of these affections, but fortunately are rare.

During the first five years of life, a considerable number of children die, and thus contribute in no small part to the total mortality of the population, seeing that out of every hundred deaths, twenty-five, or the fourth part, belong to this group. This figure, which is truly alarming, is almost entirely composed of the children of the poorer classes of the population, of those who live under the worst possible hygienic conditions and neglect to observe the most rudimentary rules of hygiene, and for this reason merit a special study which we cannot at present undertake, but which, deducted from the general mortality, corroborate the proposition I have presented.

The rest of the diseases which I have not indicated, contribute in the aggregate so small a figure to the total mortality, that it is not worth while to take any notice of them now, especially as none of them constitute one of the scourges of humanity.

To conclude, we may affirm that the only diseases existing in Vera Cruz, which are capable of driving off the stranger, and which have in fact prevented the increase of its population, are, in their order of frequency: the affections of the digestive tube, tuberculosis, those of malarial origin, and yellow fever.

The above remarks do no imply that Vera Cruz enjoys a good climate; but, far from this, the number of deaths, as compared with the number of inhabitants, approximates an average of 51.28 per thousand, a figure that is altogether too high; but we must at the same time bear in mind that it is only due to a very limited number of diseases, some of which, such as those of the digestive organs, originate in the anti-hygienic customs of the inhabitants; whilst those which relate to infant mortality are due to the prejudices and carelessness with which they bring up and educate their children. The remaining diseases, which the individual can generally avoid, are the tuberculous, paludic affections, and yellow fever, these being the only ones that a stranger, whether Mexican or foreigner, has any real cause to fear when he comes to settle in the port, seeing that the others I have mentioned, although furnishing a strong contingent to the mortality, are due to ignorance and many superstitions or prejudices of those who make up the mass of our people, and who pay with their lives and with those of their children for these two principal faults, but that can in no way affect the educated foreigner.

These diseases are avoidable, and it is within human power, if not to bring about their complete disappearance, at least to reduce their numbers to a very low figure, in their individual manifestations, by the sanitation of the towns and by obliging the inhabitants to a strict observance of the rules of hygiene, both public and private.

The supreme government of the nation is doing its best, by all the means within its reach, to comply with this program, either by the spread of education among the masses of the people, so as to raise their intellectual level, and thus uproot deep and old prejudices, so that each may contribute to the general welfare; or by undertaking sanitation works in the towns, without looking to the expenses that have to be incurred in their execution; or by organizing special services whose object will be the proper attention to the patients, in accordance with the latest discoveries of science, so that they may not constitute a danger to their fellowmen, as well as by avoiding, through all possible means, the propagation of infectious diseases and obliging all persons to comply with the rules of hygiene.

Up to the present date and for reasons that are not now to the point, Vera Cruz has been a dirty city, unprovided with a proper system for the disposal of the refuse of her inhabitants, which was stored in permanent deposits that from time to time were emptied; besides which the supply of drinking water was very small. This dark picture is about to disappear.

The net of sewers, house and water drains, which is intended to carry the whole of the refuse outside of the city and discharge it into the sea outside of the sea walls that protect the port, has now been completed and only some small detail works are now wanting that the contractors have been required to execute, before the system can be officially taken over, and this will be done within a very short period, as some wards of the city already have all the houses connected with the sewers, closets and other sanitary arrangements completed and everything working with perfect regularity.

Three months ago, the city council received the new water supply system, which provides 225 litres per day of filtered water for each inhabitant, under sufficient pressure to rise to the highest stories within the city, and every house proprietor is obliged to supply his house with the necessary plant for the distribution of the liquid, without which no sanitation or hygiene is possible.

The respective contracts have already been signed, and the work will very shortly be commenced for the general leveling of the city, so as to establish superficial drainage, for the purpose of catching and leading the storm waters into the sea. The contracts also provide for paving of the streets, thus suppressing the open drains and pools of mud that now exist, in which all kinds of rubbish and organic matter that come from the sweepings, undergo a putrid fermentation that leads to the formation of foci of infection; the water puddles and small swamps that are at present formed in the streets on account of their faulty formation and pavement, are so many other foci of infection, especially of yellow fever and malaria, because they form breeding places for mosquitoes; but when these works are completed, it will be easy to sweep and water the streets in a way that cannot possibly be done at present in the greater part of them, because they are covered with a loose and moving sand. Once all this is done, the proprietors will be obliged to lay an impermeable pavement in their court yards, and this will greatly facilitate the task of keeping them clean. Steps are now being taken to fill in all the wells in the houses, and as fast as they are connected with the sewer system, the deposits above referred to will also be covered.

A vigorous campaign has also been undertaken against yellow fever, under the direction of Dr. Eduardo Liceaga, President of the Supreme Board of Health, whose well considered orders issued in view of the latest discoveries of science, are being efficiently carried out by all the employes under his orders. Since that campaign was initiated, there has been a very remarkable decrease in the number of patients; no epidemic has been observed, but only a few isolatd cases, so that there is good reasons to presume that Vera Cruz, like Havana and Rio Janiero, will eventually be able to stamp out the disease.

If the objective and principal point of that campaign is the yellow fever, it has also been completed by the struggle against malaria and to impose on each and every one of the inhabitants, the obligation to observe hygienic precepts.

This continuous and persevering labor appears also to be producing its good results, as, if we compare the total number of deaths that took place in the year 1903, before the establishment of this service, with those of the present year, in which it has been in active work, we find that there were 708 deaths less in this year than in 1903.

In the year 1900, when we held our meeting in Indianapolis, I had the honor to announce to you that a scheme for the construction of a sanitary station for the service of the port had been prepared, and that the Mexican Government had contracted for the construction of the sewers and for the water supply work. I have to-day the satisfaction of announcing that what I said four years ago has been carried out, and, as I have just related, these works have been terminated; the sanitary station will be inaugurated in a few days, and I would take great pleasure in showing you over those works whenever you are pleased to come. For the present, I can only show you photographs of the plan of the sanitary station and of its principal departments. In the same way, I hope that what I now have the honor to announce to this meeting, I will very shortly have the pleasure of reporting as completed: That Vera Cruz is transformed into a healthy and hygienic city, through the efforts of the supreme government of the nation, and of the health officers. We never anounce anything that we have not good reason to feel certain will be realized.

OFFICIAL REPORT OF THE PROCEEDINGS OF THE THIRTY-SECOND ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

MONDAY, OCTOBER 9, 1905.

The Laboratory Section held its meetings at the General Wood Laboratory, under the Chairmanship of Dr. V. A. Moore, of Ithaca, New York.

TUESDAY, OCTOBER 10th.—FIRST DAY.

MORNING SESSION.

The Association met at the Ateneo, and was called to order by the President, Dr. Carlos J. Finlay, of Havana, Cuba, at 9:45 A. M.

The Secretary announced that a daily program would be issued.

THE PRESIDENT. — The first order is the reading of the minutes of the last annual meeting.

DR. WILLIAM BAILEY, of Louisville, Ky. — Inasmuch as the minutes have been printed in the annual volume of transactions, to save time, I move that the reading of them be dispensed with, and that they be adopted as published.

DR. J. N. MCCORMACK, of Bowling Green, Ky.—I second the motion. Carried.

THE PRESIDENT.—We will now listen to the report of the Executive Committee by the Secretary.

THE SECRETARY. — The Executive Committee has nothing to report except its action upon applications for membership.

The Secretary then read a list of the applications for membership which were recommended by the Executive Committee to the Association for election, and, on motion of Professor Robinson, the Secretary was instructed to cast the ballot of the Association for the names mentined, which he did, and they were declared duly elected.

Dr. C. A. Snodgras, of St. Louis, Mo., read a paper entitled "Purification of the St. Louis Water Supply by Using Ferrous Sulphate and Calcium Hydroxide as a Coagulant, Followed by Plain Sedimentation." (See page 39.)

Mr. F. S. Hollis, of New Haven, Conn., contributed a paper entitled "A Practical Test of the Copper Sulphate Method for the Removal of Micro-organisms From Water Supplies," which was read by Dr. F. F. Wesbrook, in the absence of the author. (See page 25.)

Dr. A. H. Doty, of New York City, contributed a paper on "The Use of Copper Sulphate Alone or in Combination With Lime for the Destruction of Mosquito Larvæ, as a Deodorant, and as a Disinfectant," which was read by Professor Robinson, in the absence of the author. (See page 50.)

Mr. George W. Fuller, Chairman, made a verbal report of the Committee on Purification and Preservation of Water Supplies. (See page 15.)

DISCUSSION.

Dr. C. A. Snodgras, of St. Louis, Mo.:—Mr. President—I will only attempt to reply to a few points raised by Mr. Fuller. In regard to the newness of the process of purification of water in use in St. Louis nothing is claimed for it, but we do claim something for the simplicity of application. The amount of dissolved iron that is to be found in all the mineral analyses of this treated water is far less than that found in human milk.

As for the effects of caustic lime, all pediatrists know that lime-water is extremely beneficial for even the most delicate alimentary tracts, and the amount of caustic lime which reaches the consumer by this system is *nil*.

As for the clarification or esthetic properties of the water I offer samples, and the water we offer is that which we will offer you if you come to St. Louis. We have fairly esthetic tastes, and those are samples I have passed around. The appearance of the water is good.

I am a little surprised to hear Mr. Fuller make an excuse for mechanical filters. We have always advocated their use, and under certain conditions do so to-day. They are a good thing; therefore, it is useless to say anything about death rate. What is true of the death rate following the use of mechanical filters we claim will be true of this process. So far as the use of mechanical filters in the future is concerned, in some localities surely they will be continued, but in St. Louis, I believe, never.

Dr. Frank Warner, of Columbus, O.:—I was very much gratified to hear the statements made by these gentleman in their papers. What Dr. Snodgras said with reference to stopping the colon bacillus and the typhoid bacillus from entering water may be true; yet, at the same time, it seems to me that in considering any of these questions relating to the improvement of the public water supply there should always be included a better protection of the watershed. I know in the state in which I live (Ohio) that whenever any city puts in a purification plant the people offer it as an excuse for no longer protecting the watershed, thus failing to guard against all sorts of filth getting into the water. I think it would be well for us to impress upon the public that whenever such plants are being put in a city should not subsequently relax its best efforts to supply as good a water as it is possible to do to the filtration plant; that it should not depend absolutely upon such a filtration plant in removing every typhoid bacillus.

Mr. H. W. Clark, of Boston, Mass.:—There are one or two points in connection with the paper in regard to the treatment of the St. Louis water supply that I should like to mention. One of these points has been referred to before, I believe, in a previous report of the committee of this Association on the "Purification of Water Supplies." The members of the engineering commissions who presented alternate plans for obtaining pure water for St. Louis would undoubtedly hold, as I believe all versed in the subject would, that the present plant as described by Dr. Snodgras does not provide a pure water for the city. That is to say, the removal of 94 per cent of bacteria from the river water — the result of this chemical precipitation plant — does not give a bacterially-safe water according to modern ideas. It is simply a makeshift.

At Lawrence, Mass., years ago when we had so many severe epidemics of typhoid fever, the water pumped from the Merrimack River and distributed throughout the city first passed through a storage basin or reservoir, and in that basin about 93 or 94 per cent of the total number of bacteria present in the river water when it entered the basin were removed by storage, etc. This removal of 93 or 94 per cent of the bacteria, however, was not sufficient, as shown by the recurrence of typhoid fever in the city year after year. Since the Lawrence filter was built, in 1893 however, typhoid fever has been practically eliminated from the city. That is to say, it has one of the lowest death rates from that cause of any city in Massachusetts. This filter removes about 99 per cent of the bacteria, only 5 or 6 per cent more than were removed a large part of the time by the storage basin alone; and yet this difference between 94 and 99 per cent means the difference between an unsafe and a hygienically safe water as far as Lawrence is concerned, and, by inference, as far as St. Louis is concerned.

Mr Robert Spurr Weston, of Boston, Mass.: — The speaker has been interested in Dr. Snodgras' paper, and especially in the samples of clarified water exhibited, and would caution the members against considering samples of water exhibited as an average representative of the work of the purification plant at St. Louis, because samples do not agree with the figures given in Dr. Snodgras' excellent paper. They represent the best work of the process. It is stated that clarified water frequently has a turbidity of 35 parts per million. The samples shown have a turbidity of less than 3 parts per million. Mr. Fuller has just said that 3 parts per million would be apparent in a tumbler to the ordinary observer. Therefore, the St. Louis water might be 10 times as turbid as the samples and still be a product of the St. Louis plant.

The speaker visited this plant last October, and was very much interested in its working. St. Louis is to be congratulated on having made so important an advance toward the purification of her water supply.

The process, however should also be considered from the standpoint of the engineer who has to do with the management of water-works, who must consider at some time or other whether or not magnesium hydrate forms as a result of the lime treatment and whether or not this hydrate will form concretions on the valves and in the small pipes which supply residences, thereby interfering with the satisfactory operation of the distribution system. This and some other problems must be solved before this process can be said to be universally applicable, especially to waters containing large amounts of magnesium.

As a preliminary measure, or as a means of treating water previous to filtration, it is a great step in advance and reflects great credit upon the officers of the St. Louis water-works.

On motion, the Association adjourned until 2 P. M.

FIRST DAY — AFTERNOON SESSION.

The Association reassembled at 2 P. M., and was called to order by the President.

Prof. F. C. Robinson, of Brunswick, Me., read the "Report of the Committee on Disinfection and Disinfectants." (See page 58.)

THE SECRETARY: — A paper has been handed in by Dr. Walter D. Greene, health officer of Buffalo, N. Y., on the "Disinfection of School Books, With Especial Reference to Its Effect on Scarlet Fever."

On motion of Dr. J. N. McCormack, it was decided that Dr. Greene's paper be read now.

Dr. Walter D. Greene, of Buffalo, N. Y., then read a paper with the above title. (See page 67.)

DISCUSSION ON THE REPORT OF THE COMMITTEE ON DISINFECTION AND DISINFECTANTS, AND THE PAPER OF DR. GREENE.

DR. HIBBERT W. HILL, of Boston, Mass.: — I wish to make one addition to the literature presented by Dr. Robinson in his report relating particularly to thermometers. Dr. Denney, of Brookline, has shown that "if two or three drops of formalin (40 per cent. solution of formaldehyde) are put in the thermometer case, they are taken up by the absorbent cotton usually kept at the end of the case, which will remain moist for a number of days. Formaldehyde gas is freely given off from the formalin, but is confined in the air-tight chamber of the case. If the formalin has been freshly added, the surface of the thermometer when taken out of the case is often covered with minute sweat-like drops of fluid, showing the high humidity. The small size of the chamber, the high humidity, and the high temperature if the thermometer is carried in the vest pocket furnish conditions very favorable for the disinfectant action of formaldehyde. The thermometer should be washed in water both before and after using. If by mistake the thermometer is put directly into the patient's mouth, the taste is somewhat unpleasant, but no serious effects result." Under the circumstances, this is a thorough method of disinfection. Dr. Denney's excellent article can be found in the Boston Medical and Surgical Journal, June 2, 1904.

With regard to the permanganate method, we experimented a little with that method at one time, and found that a certain amount of formaldehyde is destroyed in the chemical reaction; it was difficult to determine how much. So far as we could make out, the cost of producing formaldehyde gas by that method was greater than that of other methods available. I do not suppose it can be claimed that a cubic yard of formaldehyde gas produced by any one method will kill any more efficiently than another cubic yard of formaldehyde gas produced by some other method. The controlling factor seems to be the degree of humidity, and in the use of the permanganate method, there is difficulty in securing a high humidity, unless accessory means are used, otherwise the humidity is raised only so much as the evaporation of the water actually in the formaldehyde solution itself will do it.

With regard to standardization of disinfectants, it has seemed to me for a long time that the unit finally to be adopted was one which could be used to represent the cost, per unit of killing power, for each separate disinfectant and method. So far as the efficiency of any method of disinfection is concerned, we should figure the cost per killing unit, decide upon the unit of killing power which we get, and how much we have to pay for it. Once this is determined, an intelligent judgment as to other factors, convenience, rapidity, cost of labor involved, etc., can be made; selection of the best disinfectant for use under the conditions existing can then be finally arrived at. It must be remembered also that the initial cost of apparatus, and the maintenance, labor and amount of formalin used are all factors. For a very few disinfections, it is cheaper to use relatively large quantities of formaldehyde in a relatively wasteful manner, than it is to go to large initial expense for good, economical apparatus, provided the disinfection obtained is equally good. But where a great many disinfections are to be done, the initial cost of an economical service or method—that is, one that requires only the use of the minimum efficient quantity of formaldehyde, is decidely a small factor. Sound business policy requires the consideration of these matters, in public affairs, as well as in engineering problems.

DR. C. A. SNODGRAS, of St. Louis. — I desire to call attention to one point in connection with this discussion, and that is, in the city of St. Louis there has been a great deal of litigation against milk vendors because of formaldehyde or formalin having been used as a milk preservative.

In order to furnish data for the chemists and authorities to act upon, I conducted a series of experiments, and would call your attention to the effect of formaldehyde used in milk in the proportion of one in ten thousand to one in fifty thousand. The data in one table shows that the addition of formalin to milk in the proportion of one in ten thousand, one in twenty-five thousand, and one in fifty thousand, had little or no effect upon the bacterial count; and that the milk remained sweet for only twenty-four hours at room temperature when the dilution of formalin was one in ten thousand. It was shown by experiments that the number or organisms in typhoid infected milk, kept at room temperature, are reduced when the dilutions of formalin are one in ten thousand, one in twenty-five thousand, and that they are increased when the dilution is one in fifty thousand. Again, the number of organisms in sterile milk infected with typhoid bacilli is increased at a rapid rate when the milk is kept at room temperature. I desire to mention here the following table:

STERILE MILK INFECTED WITH TYPHOID BACILLI, ROOM TEMPERATURE 25° C.

Formalin Dilution.	Original Count.	Number of Colonies at the end of 24 hours.
1 to 10,000	33,800	2,000
1 to 25,000	33,800	8,500
1 to 50,000	33,800	66,000

Another thing brought out in my investigations was that the increase of organisms that naturally belong to milk was much more rapid than the increase of pathogenic organisms when the same dilution was used.

I would like to ask the gentleman who read the report, if the committee made any tests with the generating method? If so, what were the conclusions? Also, did you make any observations when cultures were placed at different altitudes of a room, as, for instance, on the floor, half-way up, and at the top? If so, what were the findings?

DR. EDUARDO LICEAGA, of Mexico (interpreted by Dr. Torralbas), stated that it is necessary to discuss a little more the subject of disinfection, and he mentioned some experimental work done by himself and Dr. Lopez, in regard to the efficient proportion and the method of accomplishing disinfection in the best way. If a car or room is to be disinfected, for instance, one method is to place in a jar covered with a little gauze some mosquitoes, and if those mosquitoes are found dead after the disinfection of the car or room, the disinfection proves to be thorough. With this method he has proven that cyanic acid kills mosquitoes in a shorter time than any other disinfectant. Twenty grams of sulphur per cubic meter they have found will kill mosquitoes in two hours. The mosquitoes try to escape, on account of the action of the sulphur vapors, but they cannot do so as the windows are covered, and the sulphur not only kills them, but acts as a disinfectant.

PROFESSOR ROBINSON (closing the discussion).— With reference to what has been said by Dr. Hill, I wish to say that it is all very true, and we know that his work and that of others has shown the necessity for humidity in connection with the method mentioned. Of course, there is the question of first cost. If we buy expensive apparatus, we are more likely to use it economically. It may cost a little more for material without expensive apparatus, and thus, of course, the expenses may be evened up.

In the case of permanganate, I have said that six ounces and a half would cost about five cents for the permanganate, and something like twenty cents for the formaldehyde—about twenty-five cents for a thousand cubic feet. It is not excessive in any respect, inasmuch as no expensive apparatus is used.

In reference to the amount, you will notice that we have used in these experiments double the amount that Dr. Greene and others have referred to. We have felt that it was best to do so, and all those who have tried it think it is best to use more than enough rather than just the theoretical amount.

In regard to what Dr. Snodgras said about putting it in different parts of the room at different altitudes, I will say that if he will consult the records of this Association since this Committee was organized, he will find that the points he mentioned have been covered two or three times. He will not only see Dr. Hill's work and our own work, but he will find reference in those reports to what has been done by others.

Finally, in reference to floors, I do not believe that it is ever safe to depend upon any gaseous disinfectant to disinfect a room without some treatment of the floor with some solution of a disinfectant. The most efficient disinfectant in my judgment that can be carried out is to use a weak solution of the disinfectant on the floor and the woodwork, and a good amount of gas in the room. There is a tendency to use a little formaldehyde gas in a room and then regard it as disinfected. That idea is wholly wrong.

A question was asked about this report, and I thought I made it clear that the report embraced very largely what had been done during the last year. Other important disinfectants may not have been referred to, but they probably were referred to in last year's report.

The Secretary then read a letter from the American Club extending an invitation to the members and guests to visit the Club and partake of its hospitalities and privileges during their stay in Havana.

On motion, the invitation was accepted.

DR. CHARLES V. CHAPIN, of Providence, R. I., read a paper on "The Sources of Infection." (See page 86.)

DR. ERASTUS WILSON, of Havana, Cuba, followed with a paper entitled "The Actual Sanitary Conditions in Havana, and the Further Requirement for Their Improvement." (See page 238.)

DISCUSSION ON THE PAPERS OF DRS. CHAPIN AND WILSON.

DR. WILLIAM BAILEY, of Louisville, Kentucky. — I want to express my admiration for and interest in the paper read by Dr. Wilson. While Havana, under the administration of the United States, accomplished a great deal, yet it is a wonderful manifestation of honesty for us to have so plain a statement made to us as this. It is a condition not unfamiliar to many of us living in cities in the United States. We know exactly what this condition is. We have had apt illustrations of the great improvements that have come from a sewerage system in the city of Memphis, Tennessee. We have many cities of our own in the States, the officials of which know exactly the work that has been advised in this paper. I rise simply to congratulate the authorities of Havana on what they have done, and to express hope for the future.

I move the adoption of the resolution offered by Dr. Wilson expressing the sentiment of this Association that that work ought to be done. Seconded. (Referrred to the Executive Committee.)

DR. J. N. MCCORMACK, of Bowling Green, Ky. — I desire to offer a resolution which I will ask, under the rules, to be referred to the Executive Committee, that this Association most cordially urges upon the attention of the Civic authorities of Havana, the importance of inaugurating at the earliest possible day, a modern system of sewerage for this city as a demand of modern science. Seconded. (Referred to the Executive Committee.)

THE PRESIDENT. — I will say in regard to the resolution that has just been offered by Dr. McCormack, that a contract has been let for several years to build a new sewerage system for this city, and the authorities are only waiting for the execution of certain financial arrangements. Therefore, it would seem to me to be out of place to suggest a resolution regarding a thing which is clearly understood by the government.

DR. MCCORMACK. — The fact that this matter has been in contemplation for several years is my reason for urging an immediate carrying into effect of those intentions.

DR. MARCUS HAASE, of Memphis, Tennessee.— I am sure that we are under obligations to Dr. Chapin for presenting this excellent paper. I was particularly interested in what he said with reference to medical inspectors of schools. The inspector we have in the city of Memphis last year reported numerous cases of scarlet fever in one locality, and in trying to trace them, which we should do as well as smallpox cases, we found that eighteen cases could be traced easily back to one child who had been attending school, with an unrecognized case of scarlet fever. Had we at that time, which unfortunately we had not, a medical inspector, he would have seen the case or at least the desquamation following the case of scarlet fever, and in that way at least prevented other cases from occurring. Among the eighteen cases, two died.

In regard to what was said with reference to smallpox, I saw a number of cases and traced them back to a case in which I could not find anything except the remains of two pustules, those on the right arm, and this patient declared that he did not feel ill except one day. There was only one day during which he had slight elevation of temperature. The rest of the time he was well. This case shows that here was an instance of a patient with smallpox being practically well, and yet giving it to a number of others.

DR. FRANK WARNER, of Columbus, Ohio.— I was very much pleased with the report of Professor Robinson on disinfection and disinfectants; but it seems to me he hardly laid enough stress upon the disinfection of the telephone. While permitting them to go without disinfection may be all right in smaller towns and with private telephones, yet in cities in which there are public telephones, where people are constantly running into drug stores and grocery stores promiscuously to use the instruments, it seems an item of importance to disinfect those telephones from time to time by the methods which have been mentioned, in order to limit the spread of infection.

It is an important matter to have medical inspectors in public schools to prevent the spread of infection. This is especially important in the larger schools in larger cities, where they have money to employ inspectors. But it is essential to have some method other than employing inspectors in the smaller towns where they are already burdened to the last degree in the employment of officers for various purposes. It seems to me an important method, in these latter places would be to have health officers suggest or direct the teachers to inspect all pupils who may have sore throats, so far as this can be done by lay persons, and then have such pupils sent home at once, requesting that the parents send for a physician. In that way we would in a measure aid in preventing the dissemination of diphtheria at least.

Dr. Bailey K. Ashford, of Porto Rico.— With reference to Dr. Chapin's paper on the sources of infection, he spoke of infectious microorganisms and of the practicability of treating people who are sick. In the treatment of uncinariasis, Dr. Bruns mentions the fact that they tried the plan of treating all who were sick and found that it did not work; that the disease kept on increasing. Finally, they examined all who were infected, and then excluded those who were infected, and this reduced the number of cases of the disease very materially. The percentage fell from 6 to .8 per cent. of all who were sick.

Dr. Walter D. Greene, of Buffalo, N. Y.— We do not need to worry about the telephone. I had a series of experiments made last year in hotels and public buildings, and our bacteriologists reported that there were very few organisms of any kind found in the telephones. These experiments covered two weeks.

Dr. Hibbert W. Hill, of Boston, Mass.—I would like to ask if anyone knows of a single case of any disease that has been transmitted by the use of the telephone? Never mind what the evidence is. If we have such a case, we would have something to work on.

Dr. Frank Warner, of Columbus, Ohio.— In answer to the question of Dr. Hill, I do not know of any infectious disease contracted from the use of the telephone. But I do know of many people using the telephone who have been ill at the time with one or another of the infectious diseases which we know always have at one time or another, germs of infection in the mouth of the patient. I know, too, that after the use of the telephone by such a patient, infective germs are frequently found. It seems only logical to believe that one using this instrument after such a patient with these germs lodged upon the transmitter, would not find himself less likely to escape the infective influence of these germs than he would if he had breathed them in from any other source.

The disinfection of the telephone is a simple matter. It seems to me that we should destroy infective germs wherever we find them.

DR. JAMES A. BURROUGHS, of Asheville, N. C.— As my practice is almost exclusively confined to the treatment of tubercular patients, and I am so thoroughly convinced that tuberculosis can be contracted from the use of the telephone, I have the mouthpiece of my phone rubbed out with pure turpentine every afternoon. In some instances we have taken the little droplets of sputa coughed out by patients, and the microscopist has mounted and examined them and has found tubercle bacilli. If we have little drops of sputum on the phone that contain tubercle bacilli, when these become dry we can get infection that way more quickly than with almost any other method. I know it is a source of infection.

DR. CHAPIN (closing).— I do not know that I have anything particular to add to what has been said. I have no definite views to present, but simply read a paper about some problems that have worried me. We try to isolate cases of the various contagious diseases, but the question is how far ought we to go? We want to settle that if we can, and I want to get assistance from you, and it is for that reason I read the paper.

In regard to the spread of infection by smallpox patients who are seemingly absolutely well, as referred to by Dr. Haas, I must confess that I have never seen a case of that kind. However, I am glad to know of it.

In regard to what was said by Dr. Ashford with reference to hookworm disease, I have no knowledge of that disease, but the facts presented by the doctor are extremely interesting.

Dr. Frank Warner, of Columbus, Ohio, read the "Report of the Committee on Demography and Statistics in Their Sanitary Relations," in the absence of the Chairman. (See page 135.)

DISCUSSION.

DR. MARCUS HAASE, of Memphis, Tenn.— I would like to say that there is a bill now before the Legislature of the State of Tennessee in regard to the registration of births and deaths; but I do not know how successful we are going to be in having it passed.

On motion of Dr. McCormack, the Association then adjourned until 8 P. M.

FIRST DAY—EVENING SESSION.

The Association re-assembled at 8 P. M., and was called to order by the President.

Prayer was offered by the Rev. Padre Cristobal, Secretary to the Bishop of Havana, Mg. Estrada.

Addresses of welcome were delivered on the part of the Government of Cuba by Dr. Cancio, Secretary of Public Works, and on the part of the medical profession by Dr. Lincoln de Zayas, and on the part of the Ateneo by Dr. Ricardo Dolz.

Dr. Cancio welcomed the doctors in the name of the President and of Cuba. He referred to the extraordinary change that had come over Cuba in recent years, and said that a sanitary congress here would have been unthinkable some time ago, when the sanitary conditions obtaining in Havana were frightful, and were considered a menace to all the United States Gulf ports. The speaker then cited statistics to show the extraordinary improvement.

Dr. Lincoln de Zayas addressed the Association in the name of the Cuban people. He referred to the work of the doctor in fighting disease, and said that the one platform on which all could meet, of whatever creed they might be, was the right of a man to a healthy body. Hence the importance of the doctor's mission. In conclusion, he referred to the common origin of all mankind, their unity of purpose, the fatherhood of God, and the brotherhood of man.

Dr. Benjamin Lee, of Philadelphia, then introduced his daughter, who read an address by her father, which was entitled "A Tribute to Dr. Carlos J. Finlay for His Distinguished Services to Science and Humanity in the Discovery of the Mode of Propagation of Yellow Fever." (See page 8.)

Following the address of Dr. Lee, the President, Dr. Finlay, delivered his annual address, (See page 1), after which the Association adjourned until Wednesday, at 9 A. M.

JANUARY 11TH—SECOND DAY.

MORNING SESSION.

The Association met at 9:30 A. M., and was called to order by Dr. Wm. Bailey.

Dr. Guiteras, Chairman of the Local Committee of Arrangements, announced the following:

ENTERTAINMENTS.

Tuesday, January 10th: 3 to 6 P. M. Reception to the ladies of the "American Public Health Association" at "Miramar" Hotel, Prado and Malecon Streets.

Wednesday, January 11th: 3 to 6 P. M. Reception to the members and ladies; given by Mr. H. Squiers, U. S. Minister to Cuba.

8 P. M. Banquet offered by the Committee of Arrangements to members of the Association, at the Tacon Theatre, Prado and San Rafael streets.

Thursday, January 12th: 3 P. M. Visit to Triscornia Detention Camp and Cabaña and Morro Fort, to meet at Machina wharf.

3 P. M. Visit to "Las Animas" Hospital, start from Hotel Inglaterra.

9 P. M. Reception at the Palace given by the Hon. President of the Republic.

Friday, January 13th: Excursion to "Rosario" Sugar Plantation.

Train leaves from Villanueva Station at 9 A. M., Prado and Dragones streets; returns at 4 P. M.; luncheon to be served at the plantation.

Saturday, January 14th: 9 A. M. Visit to City Hospitals.

2 P. M. Excursion to Havana Water Works.

The Secretary called the roll of the Advisory Council.

Dr. Marshall L. Price, of Baltimore, Maryland, contributed a paper on "The Restriction of Tuberculosis," which was read by Dr. John S. Fulton, in the absence of the author. (See page 113.)

Dr. V. A. Moore, of Ithaca, N. Y., read the "Report of the Committee on Bacillus Tuberculosis in Man and Animals," in the absence of the Chairman of that Committee, Dr. M. P. Ravenel. (See page 133.)

Dr. Jesus E. Monjaras, of Mexico City, contributed a paper on "Measures Proposed in the Struggle Against Tuberculosis," which was read by title, in the absence of the author. (See page 122.)

The Secretary read the "Report of the Committee on Tuberculosis," in the absence of the Chairman, Dr. Lawrence F. Flick, of Philadelphia. (See page 106.)

DISCUSSION.

DR. WALTER D. GREENE, of Buffalo, N. Y. — This subject is of vital interest to us all when we consider that one-tenth of all deaths occur from tuberculosis. There are two things which I think are of especial interest in combating this disease, and one of them is notification, and the other disinfection of the houses in which the disease has occurred.

In the city of Buffalo every house in which there has been a tuberculous case in the last five years has been disinfected thoroughly, and every house is disinfected to-day as fast as the cases of tuberculosis occur. A card index is of great importance in keeping track of tuberculous patients. The department of health is able to show to the public a card index of any case or house in which the disease has occurred for the last five years. In one house I have in mind just now there were three deaths in the last five years, in one apartment in a tenement house in which there were three different families, showing how contagion is kept in the house.

The important thing, however, to my mind is the education of the people. We may talk about tuberculosis, but we must educate the people before we can control this disease to any great extent. The reason why I speak of Buffalo is because I know more about that city than any other. The city of Buffalo has printed in English, German, Polish, and Italian a pamphlet giving directions how to avoid contracting tuberculosis, and what to do when you do get it. This pamphlet is distributed to workmen at their places of business. The people are going to help us, as they take these pamphlets to the shops; they are taken to the schools and given to the pupils to take home, and in this way we disseminate the knowledge that is necessary for the control of this disease.

New York State has taken a step backward in the last year, I am sorry to say. We built a sanitarium up in the Adirondacks for the purpose of sending patients there who were suffering from tuberculosis and not able to pay. The State last year, without the consent of the physicians of the State, passed a law whereby no sanitarium can be built in the State of New York without the consent of the supervisors of the county in which it is proposed to build. An effort will be made to have that law done away with.

It is said, that the city of New York has twenty-five thousand tuberculous patients all the time within her limits, and it seems to me in a crowded section like New York these people should be sent into the country and mountains and taken care of by the State, and this could be done were it not for this one law.

With reference to spitting on floors, a topic touched upon by Dr. Price in his paper, I think we have been laying too much stress on spitting on the floors of street-cars and on sidewalks. I believe this has been over-estimated. In our city the police department is practically under the control of the health department, and when the health commissioner says to the superintendent of police that he wants him to send some men on street-cars in plain clothes, he does so, and if they find persons spitting on the floors they are taken to the police court and fined $2.00 apiece. The publicity of that fact practically prohibits spitting on the floors of street-cars.

Dr. Frank Warner, of Columbus, Ohio.—The reporting of cases is undoubtedly of great importance in the prevention of tuberculosis. But this report of cases should be only the first step. It should be followed up with literature placed in the hands of the members of the family in which the case of tuberculosis has developed. Not only should appropriate literature be placed in the hands of people who are suffering from tuberculosis, but it is of great importance that such literature be placed in the hands of the people at large, of men in shops and elsewhere. Articles on this subject should be published in the daily press, in order that information may be disseminated among the people. I do not think it is so much a question of legislation that is needed to get the people to do certain things, as it is to educate them what needs to be done. I do not believe there are many people who would deliberately endanger the lives of others, let alone the lives of their friends. One great trouble among many classes of people — and I may say educated people, too,—is that they do not understand what to do in order to prevent the disease.

The disinfection of houses after deaths have occurred is of great importance in order to destroy any germs that may be present there. But there needs to be something more done than a mere formal disinfection of a house. Many times this disinfection is made by some one of the city authorities, who is not sufficiently familiar with the importance of making it absolute and perfect.

Sanatoria, of course, are of the greatest importance, not only from the standpoint of treatment of the disease, but from the standpoint from which we are considering the subject to-day, namely, its prevention by diminishing the number of foci of infection.

The testing of cattle for tuberculosis has proved a very important thing. At the Ohio State University we have an agricultural and dairy department. There each and every new cow entering the herd is tested with tuberculin. Whenever tuberculosis is found in a cow, that particular cow is withdrawn from the herd, and as a result of such tests a number of cattle are destroyed every year. Such dealers are able to sell milk at a higher price than the ordinary dairyman receives, simply from the fact that the people of the community know that this testing is going on, and as a result of it they are willing to pay a higher price for the milk.

The disinfection of railway cars after exposure to consumption is a matter of considerable importance, especially the disinfection of Pullman cars; and yet I do not think we should charge railroad officials with neglect in this regard, for I am convinced, after having talked with a number of officers connected with railroads, they are perfectly willing to make these disinfections, provided only we will suggest to them a rapid and efficient, but not too expensive, means of disinfection, so that the cars will not be put out of service.

Dr. Richard H. Lewis, of Raleigh, N. C.— I rise to endorse the position taken by Dr. Warner. Of course, we all admit that the problem of prevention of tuberculosis is one of the greatest that confronts us. We all know how it is transmitted, and knowing that we know how to stop the transmission of it theoretically; but practically it is a most difficult thing to do, especially in the South, where we have a large negro population in the rural districts. The first thing to do is to locate the case or cases of tuberculosis. The way to do that is thought by some to be by legislation requiring compulsory notification. That, of course, reads well on paper, but does not work in practice. Our physicians in North Carolina,— I cannot speak for those in other States,— remind me very much of a man by the name of Jim Raspberry at the time of the Mexican war. It seems they were anxious to get troops for the army, and in order to do this they had a barbecue, engaged a brass band, had a large assemblage of people, and eloquent orators to appeal to the audience. Then some one would read from a list the names of those he thought should enlist, and call out, for instance, Jim Johnson! He would answer, Here! He would march up to the platform, the band would play, the ladies would wave their handkerchiefs, and he would sign his name. They called a considerable number of names, and at last called the name of Jim Raspberry! There was no answer. Jim Raspberry! Still no answer. Finally, a fellow away off on the outskirts of the crowd, with his sunburned hair sticking through the holes in his wool hat slowly rose and said, "Here, but I ain't er gwine."

That is exactly the trouble with the medical profession. They are here, but they "ain't er gwine." They admit everything you say, theoretically, regarding tuberculosis and the necessity for its prevention, as well as the importance of notification, but they do not notify the board of health of all the cases that come under their observation. We know perfectly well that in the minds of a great many people a case of consumption is considered almost in the light of a leper. People are getting to be afraid of it, and you know that is another reason why the doctor will not report these cases, as it will be objectionable to the family to have it known that a member is the subject of this disease.

Not only that, I think practical physicians will admit that a great many of their patients will take umbrage if they make a diagnosis of tuberculosis in the incipient stage. They will not say to the physician that he is a liar, perhaps, but they will say that they don't believe him and sometimes discharge him for his candor. Those are some of the practical difficulties that beset us in connection with this disease. I have said that, theoretically, we can do much by legislation towards the prevention or control of this disease; and yet we have found that this would not work in North Carolina. When we took the matter up for consideration, and to adopt some practical plan, the method we adopted was the education of the people. This was what we aimed at — how to get at the people. In the first place we sought to prepare literature in as simple and interesting a way as we could, so that they would read it. Then, the next thing was to get this literature into the hands of the people. Ordinarily, the way to distribute literature on a large scale is to turn over a great number of the pamphlets you wish to distribute to some individual head of the people to whom you wish it sent, or given. For example, if you wish to distribute literature to public school teachers, the usual way would be to send the pamphlets to the superintendent of public instruction, and ask him to distribute them. We all know practically what that means, so that instead of adopting that method, the plan we have selected is this: In the first place, we try to secure the active co-operation of the family physician. I do not hesitate to say, however, that the active and cordial co-operation of the family physician has been practically very difficult to obtain. We addressed one of the first letters to the editors of newspapers in North Carolina. This was a personal letter, written by the secretary of the state board of health, asking co-operation in the work of prevention of tuberculosis, enclosing a copy of the pamphlet, and asking the editor to call attention to the matter editorially, and notifying people what can be done. The next letter was addressed to the family physician, and a plea made to enlist his active co-operation in the work, asking him to distribute these pamphlets quietly, without any publicity, to his patients, and instructing the members of the family as to the proper methods of prevention. Furthermore, a letter was sent to every minister of the gospel in the State, and he was appealed to as a man who came in contact with the sick and dying, who would know where every case of tuberculosis could be found, asking him to use his efforts in distributing literature, and inducing the people to carry out the directions. A letter was sent to all public school teachers of the colored race, because tuberculosis is the bane of the colored race, and is three times as fatal among negroes as it is among whites at the present time. This is strange, inasmuch as in the days of slavery tuberculosis was said to be unknown. A letter was also sent to the employers of indoor labor, making an appeal to them, asking that proper precautions be taken as well as proper care of their employes. This literature is mailed to the individual in a special envelope, an ordinary letter, in other words, and with every pamphlet is a letter, one addressed to the general public expressing the hope that every individual will read it. That, in brief, is the plan we have adopted, and we believe we are going to get more results from the sixty thousand copies of the pamphlet we have issued and sent out than by any other means. We can send out fifty thousand copies with a one cent stamp for five hundred dollars, and we believe, as I have said, for this amount of money we will get more practical results than by any other method we can think of.

Dr. Marcus Haase, of Memphis, Tennessee.—I agree with Dr. Lewis in regard to the education of the public, and attach more importance to it than the reporting of cases of tuberculosis by the family physician. Four years ago the city of Memphis passed an ordinance to the effect that tuberculosis was a reportable disease, the same as diphtheria and scarlet fever; but up to this day there have not been probably more than half a dozen cases reported. Thinking it would antagonize physicians to compel them to report these cases, we have let the matter drop and tried to educate the public.

I agree with Dr. Lewis also in the statement that the negro in the South is one of the greatest disseminators of this disease. He is more susceptible to pulmonary diseases than the white race. He lives in very unhygienic surroundings; he does not call a physician for a cough or for a little afternoon fever, and we know that he knows nothing about having tuberculosis until he appears at the dispensary, or he is really on his deathbed in the last stages of the disease.

To show you how difficult it is to get any action taken in regard to cases of tuberculosis, I will say that I presented a resolution to the Shelby County Medical Society on two different occasions, to the effect that tuberculosis is a communicable disease, and should be treated as such. Both resolutions were killed in committees; but I succeeded later in introducing a similar resolution before the Tri-State Medical Society and having it unanimously adopted. That resolution was to this effect, "*Resolved,* That tuberculosis is a communicable and curable disease."

As regards milk inspection, which was referred to in the report, I can go over briefly how this is done in the city of Memphis. The first thing must be the making of an application to sell milk within the city limits. This is made to the secretary of the board of health. It is given to the dairy inspector before a dairyman can deliver milk within the city limits. This dairy inspector visits dairies and examines them as to their sanitary condition. He also examines the herd or herds, and if he finds any cows that are affected among the herd, they are put aside. If he suspects tuberculosis, he sends for the city veterinarian, who visits the dairy farm, examines the cow or cows, and if he finds it necessary, he injects tuberculin. In that way we have gotten rid of quite a number of tuberculous cattle. This permit to sell milk cannot be granted until it is approved by the dairy inspector and the veterinarian, if necessary. Samples of milk are taken at the dairy and carried to the municipal laboratory, where they are examined for the dairy standard, that is the standard for butter and fat, etc. This milk is also examined thoroughly microscopically for pus, and if any pus is found in the milk as a whole, then the dairy inspector goes back to that dairy, has milk drawn from each individual cow in separate bottles, these bottles are sealed, brought back to the laboratory, where a microscopical examination is made to find out which cow or cows the pus comes from.

All cows condemned for dairy use are branded and a record of same is kept at the office of the department.

Dr. W. C. Chapman, of Toledo, Ohio.— Some years ago in a paper on this subject, read before the Ohio State Board of Health, I took the ground that it was not practical to ask the physicians of the State of Ohio to report tuberculous cases. Since that time I have had many talks with members of the medical profession on the subject, and from observations, the idea then expressed has been proven correct. We must not demand too much of medical practitioners. If we cannot have cases of typhoid fever reported, how can we demand from families and from physicians that cases of tuberculosis be reported? I do not believe in my city (Toledo) that all of the cases of typhoid fever are reported. I do not believe cases of other diseases are reported as they should be. When we come to tuberculosis, we know that the members of the family desire no publicity, therefore the family physician will not report the cases as they occur. That has been my experience. But how can we get at facts in regard to contagious diseases existing in families? I believe a practical way is to take the death certificates and see the cause of death, whether it be tuberculosis or not. If a physician states on the death certificate that the death was due to consumption, we have the power legally to enter the house and examine its condition, and by disinfecting it we will do something towards minimizing the danger of contagion being carried from that house to another. In the present state of our knowledge, I believe we all consider tubuerculosis as communicable, although there are a number of good physicians who do not believe this, and if they do not so believe, how in the world, with any legal measures, are we going to be able to make them report such cases? They will not do so; and statistics are therefore not reliable.

Dr. Manuel S. Iglesias, of Vera Cruz, Mexico, read a paper on "Hygienic Conditions of Vera Cruz, Present and Future." (See page 242.)

On motion of Dr. Liston H. Montgomery, the Association adjourned until 2 P. M.

SECOND DAY — AFTERNOON SESSION.

The Association reassembled at 2 P. M., and was called to order by Dr. E. P. Lachapelle.

Dr. Aristides Agramonte, of Havana, Cuba, read a paper entitled "The Practical Utility of a Medical Board to Aid Local Sanitary Authorities in the Investigation of Infectious Diseases. (See page 104.)

DISCUSSION.

Dr. Charles V. Chapin, of Providence, R. I.— I would like to ask Dr. Agramonte how this board is appointed, and if its members receive any compensation from the municipality? If so, how great a compensation?

Dr. Agramonte.— This Board is appointed indirectly by the sanitary department. The appointments are made by the secretary of the government, who is the recognized chief of that department. The members of the board receive remuneration in the shape of a fee for each visit they make to these cases.

Dr. Samuel H. Durgin, of Boston, Massachusetts, read the "Report of the Committee on the Infectious Period of Communicable Diseases." (See page 74.)

Dr. F. F. Wesbrook, of Minneapolis, Minnesota, read a paper entitled "Diphtheria Infection in Minnesota, Especially in School-Children, and Institutional Epidemics." (See page 94.)

DISCUSSION.

Dr. Charles V. Chapin, of Providence, R. I.— Mr. President: I think health officers all over the world owe a debt of gratitude to Dr. Wesbrook for his thorough researches into the morphology of the diphtheria bacillus, and into its distribution in the sick and well people, as well as for his study of the use of cultures as a means of suppressing outbreaks and checking the spread of the disease in families. He has certainly presented his conclusions in a forcible manner, and they are worthy of the careful consideration of every health officer. There are a number of instances, particularly in small communities, where the methods he has proposed should be carried out, and, if carried out, would bring about the results which he has narrated. But it is not unfair to him, or to the subject in general, to say that sometimes success does not attend such efforts. In Providence we have had lamentable failures. Recently we have had an outbreak in a small institution in which there are about twenty children. Isolation was maintained. We finally obtained two or three negative cultures from the throat and nose of every person in the house. Disinfection was then carried out. A few days afterwards a child was admitted, and while we have no proof that it contracted diphtheria there, yet it became sick within forty-eight hours after going to the institution. We followed the methods which Dr. Wesbrook has suggested in a larger institution. About one-half of the children were infected, and those who were not infected were put in another house. We tried to get successive cultures from the throats of every infected child remaining in the main building. We worked for months and did not succeed. The effort was given up; the managers of the institution would not stand for it, and as a result they have had diphtheria in that institution for over a year. We had another institution of a similar kind with about the same number of children; we followed these methods, but without getting the institution free from bacilli, and finally gave up the attempt. Fortunately, in this institution we had no more diphtheria, though some of the children must have retained the infection. We attempted in Providence at one time to require a single negative culture from both throat and nose from every member of the infected family before the cessation of isolation. We incurred the enmity of the medical profession; we incurred the enmity of the courts. I had three suits brought against me for personal damages for keeping well persons in the house when they had diphtheria bacilli in their throats. I tried to keep one child out of school who had diphtheria bacilli in the throat, and the school committee directed the superintendent of schools to have the child admitted to school. We had to give up the method. Two years ago we decided to raise isolation, take down the placard, and disinfect ten days after the disappearance of the membrane, and, as a matter of fact, during the next year we had less diphtheria than we had had for five or six years.

DR. CHARLES O. PROBST, of Columbus, Ohio.— I should like to say that Dr. Wesbrook's paper was very interesting to me, as the question comes to the executive man as to how much reliance can be placed on the laboratory findings where there is a conflict between the laboratory and the clinician. We have had an outbreak of diphtheria in the orphans' home, an institution containing some eight hundred children. Specimens were sent to the laboratory every day for a period of several months and the report was made that diphtheria bacilli were found in all of them; yet the physician in charge of the institution said that in four or five days the children were well. We kept up the examinations from January until some time in May, having made in that time over two hundred examinations of non-clinical diphtheria. A bacteriologist was sent to the institution, who spent a week there examining cases and making cultures from the throats of those well as from the throats of those who had some throat infection present. The percentage of findings was as great in the children who had no symptoms as it was in those who had symptoms of diphtheria. The question came up to me, as an executive health officer, whether those children should be dismissed and go to their respective homes. There were four or five hundred children altogether from various parts of the State. We decided they might go. No bad results followed from that. But there was a conflict between the laboratory and clinician, and I hope some one will have something to say on that side of the subject.

DR. CARLOS J. FINLAY, of Havana, Cuba.— I would like to ask Dr. Wesbrook whether he has injected anti-diphtheritic serum as a preventive or for the purpose of controlling the disease?

DR. MARCUS HAASE, of Memphis, Tenn.— The trouble we have had in the city of Memphis has been that the clinician would report a case of diphtheria, while our laboratory men would not be able to find the Klebs-Loeffler bacillus, which would be necessary, so as not to antagonize the physician by putting up a placard and going through the form as if the case was real diphtheria. I hardly believed there was a case of diphtheria present unless the Klebs-Loeffler bacillus was found.

I would like to ask Dr. Wesbrook whether he would advise quarantining a case or cases until he received two negative reports from the laboratory?

DR. C. A. SNODGRAS, of St. Louis, Mo.—Apropos of the question asked by Dr. Haase, I will say that in the city of St. Louis, if a physician reports a case of diphtheria, the house is placarded, and after two days if the physician in charge should so request the placard is taken down and the house disinfected. In my last annual report, in a great per cent of the cases reported clinically as diphtheria by physicians, I stated that I was unable to find the Klebs-Loeffler bacillus. We have to put up a placard when a case of diphtheria is reported by a physician; although in two or three days the patient may be well. In every case of suspected diphtheria there should be a bacteriological examination made, and if the Klebs-Loeffler bacillus is not found the placard should not go up.

I admire the scientific spirit that Dr. Wesbrook has instituted in the state of Minnesota; but in a great city like St. Louis it is entirely impractical to follow the plan he has suggested. Considering the whole aspect of the subject, we are getting along fairly well, and I don't believe we are going to change our method.

Dr. Wesbrook, (closing the discussion).— I realize that I may be deemed heterodox in these matters but I am glad to hear everybody say what he thinks. Dr. Chapin and I have very many things in common and although in this diphtheria work we may seem to view things a little differently, in the main our ideas are alike. In justice to my own position, I must say again what was stated in the beginning of the paper, namely, that perhaps while we do not differ from others in the general line of work in Minnesota, in our state board of health work we do carry out the methods outlined in the paper for the smaller towns and villages and in institutions. I believe we all realize that it is a matter of public duty for us to stamp out diphtheria. In Minnesota we find it practical in small towns, say of one thousand inhabitants where there are from two to three hundred school children, to accomplish this result along these lines. In large cities there are many complicating factors concerning which others here today are better able to judge than am I. So far as St. Louis is concerned and the conditions which have been outlined by Dr. Snodgras. I should be inclined to place another construction upon what he reports. For instance, I think the reason that St. Louis has relatively a small amount of diphtheria work to investigate from a laboratory point of view, is probably due to the fact that she has little diphtheria. I believe that it is too far south to have much diphtheria and cannot therefore be compared with Boston, New York or some of the other cities.

In regard to the question asked by the President concerning the prophylactic use of diphtheria antitoxine, I would say that we employ it in institutions, especially in individuals who have been brought into contact with clinical cases and who show the presence of diphtheria bacilli but who are not showing symptoms of the disease. Under these conditions, we give a two thousand unit dose which seems to help markedly in the clearing up of the throats. In some studies made by Dr. Wilson in connection with the children's department of the Boston City Hospital and the city hospitals of both St. Paul and Minneapolis, he made daily observations of the types of diphtheria bacilli in the throats and noses of patients who were under close clinical observation. Under these conditions he endeavored to study the relationship of the types of diphtheria bacilli to the clinical conditions such as pulse rate and temperature and more particularly to the treatment used. As you know, Dr. McCollom favors the giving of large doses of antitoxine and it was noted that in a great many of the cases so treated, a marked change in the flora of the nose and throat occurred. However, we have as yet too few cases to warrant any very definite conclusions but as a generalization these studies appear to point to the fact that antitoxine diminishes the persistence and affects to some extent perhaps, the morphology of the diphtheria bacillus.

We are asked continually, How do you get along without coming into conflict with the law? Why are not suits instituted? I can simply say I do not know. It may be that in the West where we are said to have no precedent; that we get along very well without. We have been doing this work for a number of years and have never yet been implicated in any lawsuit. Usually the public requests investigation by the state board of health and we have the support of the whole community because appeal is made to the board by the community on account of the fear of diphtheria. The board of aldermen, city council or some private person may write to Dr. Bracken, the secretary and executive officer of the board about these matters. The letter may perhaps be critical of the local health officer. This is somewhat rare but if he is inclined to be spineless he is glad to have the support of the state authority. We find our best support in the school authorities. The Minnesota schools are good. Her educational institutions are developing rapidly and it appears as if they will always support us in things of this kind.

The board endeavors always to be just and absolutely honest and we ourselves believe that what we do is for the good of the community. Hitherto the public has seemed to take us at our own valuation and to help us in our efforts.

On motion of Dr. Agramonte, the Association adjourned until Thursday, at 9 o'clock.

JANUARY 12TH — THIRD DAY.

MORNING SESSION.

The Association met at 9:30 A. M., and was called to order by Dr. Wm. Bailey.

Dr. Guiteras announced for the Committee of Arrangements that there would be two excursions, one to the quarantine or immigration camp, and a visit to Morro Castle and Cabañas.

The Treasurer, Dr. Frank W. Wright, read his annual report, as follows:

FRANK W. WRIGHT, TREASURER, IN ACCOUNT WITH AMERICAN PUBLIC HEALTH ASSOCIATION.

RECEIPTS.

Amount on hand October 29, 1903	$623 57
Dues collected for 1901	10 00
Dues collected for 1902	155 00
Dues collected for 1903	1,815 00
Dues collected for 1904	40 00
Sale of Transactions, etc	652 97
Total	$3,296 54

DISBURSEMENTS.

1903.		
Nov. 17.	By cash paid American Express Co., (Order No. 150)	$62 21
17.	By cash paid U. S. Express Co., (Order No. 151)	59 74
17.	By cash paid C. O. Probst, (Order No. 152)	79 10
17.	By cash paid H. D. Pease, (Order No. 153)	44 16
Dec. 3.	By cash paid Frank W. Wright, (Order No. 154)	88 00
14.	By cash paid August Ockert, (Order No. 155)	37 50
14.	By cash paid C. G. Whaples & Co., (Order No. 156)	3 25
1904.		
Feb. 2.	By cash paid Wm. Whitford, (Order No. 157)	205 34
Dec. 14.	By cash paid C. O. Probst, (Order No. 158)	311 00
14.	By cash paid Fred. J. Heer, (Order No. 159)	806 29
14.	By cash paid Frank W. Wright, (Order No. 160)	12 30
14.	By cash paid Berlin Printing Co., (Order No. 161)	7 00
14.	By cash paid U. S. Express Co., (Order No. 162)	8 62
Dec. 31.	By cash on hand	1,572 03
	Total	$3,296 54

The report was referred to an Auditing Committee, consisting of Prof. F. C. Robinson, and Dr. Chas. S. Caverly, and Dr. Aristides Agramonte.

THE PRESIDENT.— The Secretary will now read a resolution which was referred to the Executive Committee, amended, and as amended it is now recommended to the Association for adoption.

The Secretary then read the following:

Resolved, That this Association congratulates the civic authorities, the physicians and the people of Havana in general upon the gratifying improvement made in its sanitary conditions, and especially upon their work in freeing their beautiful city from any danger from that once dreaded scourge, yellow fever, by their persistent and skillful campaign against the yellow fever mosquito.

We are especially gratified also that they do not propose to rest contented with what has been done, great as it is, but have already planned other sanitary improvements of great importance, including an efficient system of sewerage, which we wish them God speed in carrying out at the earliest practicable moment.

On motion of Dr. Agramonte, the resolution was unanimously adopted.

A paper on "Bubonic Plague in the Port of Mazatlan," by Dr. E. Liceaga, of Mexico, was read by title and referred to the Committee on Publication. (See page 226.)

Dr. Adolfo Oliva, of Guadalajara, Mexico, read a paper on "Social Hygiene." (See page 160.)

The next order was the "Report of the Committee on Hygiene of Dress," by Mr. Frank Wells, President of the State Board of Health of Michigan. (See page 153.)

In the absence of the Chairman of this Committee, it was moved, seconded and carried that the report be read by title and referred to the Committee on Publlication.

Dr. E. Liceaga, of Mexico, read a paper entitled "Yellow Fever in Mexico." (See page 214.)

This paper was accompanied by numerous charts, maps and drawings.

At its conclusion, Dr. Agramonte moved that the thanks of the Association be extended to Dr. Liceaga, and to the Superior Board of Health for the work done in the suppression of yellow fever in Mexico, which was seconded and unanimously carried.

At this juncture, the Auditing Committee made the following report:

The Treasurer's accounts have been examined by us and found to be correct, with proper vouchers, showing a balance on hand of $1,572.03.

Respectfully submitted,
F. C. Robinson,
Charles S. Caverly,
Aristides Agramonte.
Auditing Committee.

The President.— What disposition will you make of the report of the Auditing Committee?

Dr. Liston H. Montgomery, of Chicago. — I move you, sir, that the report of the Auditing Committee be adopted. Seconded and carried.

Dr. William H. Park, of New York City, Chairman, read the "Report of the Committee on Methods to Control the Milk Supplies of Large Cities." (See page 176.)

Dr. Gonzalo Arostegui, of Havana, Cuba, followed with a paper on "The Importance of Good Quality and Distribution of the Milk Supply." (See page 185.)

Dr. Alfonso Pruneda, of Mexico, read a paper on "Infantile Feeding by Nurses." (See page 193.)

DISCUSSION.

Dr. C. A. Snodgras, of St. Louis, Missouri.— Mr. President: I do not like to consume too much of the time of the Association, but this is such an important subject that I desire to get a little information from Dr. Park as the result of the work of that Committee. He discussed the subject along three different lines — farm inspection, transportation, and handling of milk. I would like to ask him, for instance, whether the inspectors of the city of New York are allowed to go out into the country to inspect dairies, and are they supported by the State authorities? Second, I would like to ask him what has been done in the way of prosecution for violation of any of the regulations which they may have in regard to disinfectants, and whether they receive support from the courts, and what has been the result of the work?

St. Louis has an extensive corps of sanitary inspectors and clerks who are working out this problem, and we have instituted more prosecutions than any city in the United States, or all of them combined. These cases have been appealed to the Supreme Court, and I am sorry to say that this crusade we have inaugurated is not meeting with the success we had anticipated. We are not getting the moral support from all sources we want.

Furthermore, as the result of the Committee's work, I would like to ask which of these various lines they emphasize? I mean by that, farm inspection, the transportation, the handling of milk, or the checking up. Which have you concluded is the better, taking the whole view of the subject, farm inspection, or the work relating to the bacteriological end of it?

Those are the main points I would like to get an expression upon from Dr. Park in closing the discussion.

Dr. Walter D. Greene, of Buffalo, N. Y.— I desire to call attention to the milk register which is of very great importance in many instances. If we have a case of scarlet fever reported, the next day the inspector of the city of Buffalo goes there and ascertains the man's name who delivers the milk, and in whose family the case occurs, and the number of cases. To show you the effect of this, a year or two ago we found 51 cases of scarlet fever in seven days on one milkman's route. We did not go beyond the city line, but we had information that in the milk producer's family there were three cases of scarlet fever. Last September the milk register showed three or four cases of scarlet fever against one milk dealer. A prominent lady died, and we went in the country and found two cases in the milk dealer's family, and he was furnishing certified milk at that. This shows the necessity of very careful supervision in that one particular.

Dr. Park, (closing).— I will only take a moment or two to answer the questions that have been asked. In the first place, the State Department gives power to inspectors from different cities to go into the country to examine or inspect dairies if the city will pay the expenses of the inspector. That gives us the power to inspect most of the New York milk supply. In the other states we may go through courtesy, as for instance, into New Jersey or Connecticut. Dealers and farmers who refuse to have our inspectors visit their places run the risk of having their permits to sell milk in New York City revoked.

With reference to the adulteration of milk with water, chemicals or preservatives, the courts of New York City have been very generous in supporting the health department. Large fines have been imposed upon the offenders, and in some cases imprisonment has been threatened. Up to the present the cases have not been carried to the higher courts. This is due both to the expense of having to fight the city, and to the injury which would be done to their business by having it published in the newspapers that the offenders were fighting the city to avoid paying a fine for having impure milk. I am glad to say, that the newspapers support us in our crusade for pure milk, and the commissioner gains popularity by showing the amount of fines paid and difficulties put in the way of those selling bad milk.

In regard to the question as to what particular feature we emphasize, I would state that while we think the conditions at the farm are the most important, yet because it is more easy to attend to the city, we are at present doing most there.

With regard to the bacterial count, it is not considered of great importance in itself, but of great value as a means of detecting the conditions that existed at the farms and during transit.

Dr. W. F. Elgin, of Glenolden, Pennsylvania, read a paper entitled

"Experiments and Experience in the Production of Animal Vaccine." (See page 204.)

Dr. F. P. Bernaldez, of Mexico City, followed with a paper on "Humanized Vaccine." (See page 211.)

The Secretary read a paper which was contributed by Dr. Vicente de la Guardia, of Havana, Cuba, on "Necessity for Vaccination and Revaccination of Individuals who have had Smallpox," (see page 210), after which, the Association, on motion of Dr. Montgomery, adjourned until 1:30 P. M.

THIRD DAY — AFTERNOON SESSION.

The Association reassembled at 1:30 P. M., and was called to order by Dr. Samuel H. Durgin, in the absence of the President.

Dr. Fernando Lopez, of Mexico read a paper entitled "Experimental Studies on the Acclimatization of the *Stegomyia Fasciata* in Mexico City." (See page 222.)

Dr. Narciso del Rio, of Vera Cruz, Mexico, read a paper on "The Disinfection of Cottages of Jacales O'Bohios." (See page 69.)

On motion, the Association then adjourned to take a trip to the "Rosario" Sugar Plantation.

THIRD DAY — EVENING SESSION.

The Association reassembled at 8:20 P. M., and was called to order by the President.

The first order was the reading of the Report of the Advisory Council.

REPORT OF THE ADVISORY COUNCIL.

For President, Dr. F. F. Wesbrook, of Minneapolis, Minn.; First Vice-President, Dr. Juan Guiteras, of Havana, Cuba; Second Vice-President, Dr. F. Lopez, Mexico; Third Vice-President, Dr. Geo. MacDonald, of Brandon, Manitoba; Executive Council (to fill vacancies), Drs. Marcus Haase, of Memphis, Tenn.; C. V. Chapin, of Providence, R. I., and Wm. C. Chapman, of Toledo, Ohio; Secretary, Dr. Chas. O. Probst, of Columbus, Ohio, re-elected; Treasurer, Dr. Frank W. Wright, of New Haven, Conn., re-elected.

The following places sent invitations for the coming meeting: San Francisco, Boston, Niagara Falls, Memphis, and Salt Lake City. The Advisory Council recommends that Boston be selected as the place for holding the next meeting.

That the thanks of the Association be extended to the other places, with the information that they will be considered in future years.

On motion of Dr. Montgomery, the Secretary was instructed to cast the unanimous ballot for the officers named in the report. Seconded and carried.

The Secretary then cast the ballot of the Association in accordance with instructions, and the officers were declared duly elected.

Drs. Lachapelle and McCormack were appointed as a committee to escort the President-elect to the Chair.

Dr. Lachapelle, speaking for the Committee, said he took great pleasure in presenting to the Association its newly-elected President, Dr. Wesbrook. (Applause.)

Dr. Wesbrook was warmly received. He said: Mr. President and Fellow Members: In the first place, I feel very nervous because I think I am utterly unable to tell you how much I appreciate the honor which this Association has done me, and I also wish to tell you that it is with a great deal of trepidation that I appear here and look forward to the next year's history of the Association. Were it not for the fact that all of the older members of the Association, those of them who were old in the Association when I first joined, have at all times shown interest in every advancement of sanitary science and ever willing to help the young men, I should feel utterly unable to come before you at this time or to look forward to being your President for the next year. I feel, however, that, as your President, I shall have hearty support. Especially is it needed at this time, when I expect to depend upon the older and wiser heads in the Association.

The Laboratory Section with which I have been more intimately connected, although I was an active member of the Association before there was a Laboratory Section, owes a great deal to the late Dr. Wyatt Johnston, of Montreal, and I think everyone is agreed that no one has done more for this Association and for the technical matters of hygiene than Dr. Johnston in his own indirect and modest way. The Association stands for advancement along hygienic lines, and it has thus far shown itself able to meet emergencies as they arose. It must be a body big and strong enough at all times to meet emergencies, to embrace opportunities and absorb all potent public health factors. I think a good motto and one which seems to be the motto of this Association, although it may not have been put in these words before, is "absolute dissatisfaction with the present; pleasure in looking back on what has been accomplished and hope and confidence for the future." This constitutes a good and progressive frame of mind. When we arrive at a condition of self-satisfaction, I for one hope it will be after I am dead. Each year we not only get individual help from one another by meeting together, but we obtain much which we can utilize when we return home and may perhaps be of some help to the localities visited.

This year we have been exceptionally fortunate in having been permitted to come to Cuba. Each one of us feels that he has greatly profited by his visit here, and I, if for no other reason, have had at least one thing to be very thankful for, namely, the opportunity of seeing something of yellow fever, and although it is interesting from a scientific point of view, one may say without regret, from the standpoint of humanity, that our opportunities for the study of yellow fever are practically past. It is through the kindness of Dr. Guiteras that I had the opportunity of seeing the postmortem examinations made upon yellow fever patients.

In closing, I wish to assure you that I am going to adopt at least a portion of the motto I have mentioned, and that is "to look forward with hope," because I know the older men will help the younger men. They have always done so. Furthermore, I wish to say that the man who should have been your President. is first Vice-President, and if I get into very great trouble, I know that Dr. Guiteras will be able to help me. His kindness and efforts here have only demonstrated afresh what so many of us knew, but we have had another opportunity of observing how he is able to meet emergencies not only in regard to public health, but in the matter of entertainment. Thus my fears are minimized to some degree.

I wish to thank you earnestly and to say again that I most thoroughly appreciate the great honor you have conferred upon me. and if I prove undeserving of it, it will not be because I have not tried to do my best. (Applause).

DR. J. N. MCCORMACK, of Bowling Green, Ky.— On behalf of my colleagues, representing the United States, seconded by Dr. Lachapelle, of the Dominion of Canada, and Dr. Liceaga of the Republic of Mexico, I have the honor to present the following resolutions, which I am sure will meet the cordial approval of this body:

Resolved, That the cordial thanks of this Association be and are hereby tendered to His Excellency, the President of the Republic of Cuba and Mrs. Palma, and to the Honorable Minister of the United States and Mrs. Squiers, for the receptions so graciously given in honor of its members, and the ladies accompanying them.

To the Committee of Arrangements, the medical profession, and civic authorities of Havana for the thoughtful and admirable preparations made in advance for the entertainment of its people, and for the perfection and courtesy with which these have been executed in every detail.

To the public press for the faithful and comprehensive reports published of the proceedings.

And to all, and especially to the fair women and gallant liberty-loving men of this great, historic and beautiful city, for a hospitality so bounteous, charming and continuous, as to make this meeting a most memorable one, and to send all who have participated in it from abroad home with the memory of an imperishable picture of flowers, gems, and all that is beautiful, and with the earnest prayer in their hearts that Cuba may forever be free. (Applause.)

On motion, the resolutions were unanimously adopted by a rising vote.

At this juncture, **Dr. Louis L. Seaman**, of New York City, arose to a question of personal privilege. He said: A report has been circulated to the effect that I sent a telegram to the New York Herald, stating that yellow fever existed in this city; that it had originated here. I wish to say, Sir, that if that report is not denied to-morrow, I will denounce the Editor of that paper as a malignant liar.

The President.— I am glad to hear Dr. Seaman deny having sent such a report.

Dr. William T. Jenkins, of New York City.— Upon the announcement of the death of the two cases of yellow fever in this city, I saw Major Seaman at the hotel just after he returned from Las Animas Hospital, and he said he was present at the death of these two patients. I immediately confirmed my previous telegram — Three cases in transit Colon to Vera Cruz; Havana not responsible. I simply stated in that telegram that Major Seaman was present at the death of those patients, and how such a telegram got out or who garbled it, I do not know. My telegram did not say that these cases originated in Havana.

Dr. J. J. Kinyoun, of Glenolden, Pennsylvania.— For fourteen years I have been interested in this Association and its work, and much of my knowledge regarding public health work has been acquired from the deliberations and publications of this body. The impression has been conveyed during the last few days that some members have been responsible for statements derogatory to the sanitary condition of the Island of Cuba. I have been very glad indeed to hear Major Seaman's disavowal of such statements. I therefore move that we pass a vote of confidence in the present sanitary authorities of this Island.

Dr. Seaman.— I heartily second the motion.

Dr. William Bailey.— As a member of this body, I so thoroughly believe in the protection of Cuba and of the world, if these principles are carried out, that I exposed myself by visiting these two cases, which I perhaps would not have done years ago.

The motion of Dr. Kinyoun was then put and unanimously carried.

Dr. Guiteras thanked the Association in the name of the health authorities of Cuba for the vote of confidence just passed. He also took this opportunity to thank the members of the Association for the resolutions presented by Dr. McCormack, containing, as they did, such pleasing words referring to the local committee. (Applause.)

On motion of Dr. McCormack, the remainder of the papers on the program were read by title and referred to the Committee on Publication.

Dr. Finlay, the retiring President, expressed his profound thanks for the kindness and courtesy extended to him by the members as the President of the Association, and hoped that the next meeting in Boston under the presidency of Dr. Wesbrook would be a great and grand success.

On motion of Dr. Liston H. Montgomery, the Association then adjourned *sine die.*

CHAIRMAN'S ADDRESS, LABORATORY SECTION, AMERICAN PUBLIC HEALTH ASSOCIATION, HAVANA, CUBA.

BY DR. V. A. MOORE, ITHACA, N. Y.

Custom has decreed, that an unwritten duty of the chairman of this Section is to deliver an address at its annual meeting. My predecessors have come to these gatherings from laboratories devoted largely, if not entirely, to public health service. They have in consequence thereof brought valuable instruction concerning some important laboratory problem, vital to the advancement of the great work of preventing disease, which is the essential and noble mission of this body. As it has not been my privilege, save for very brief periods, to be immediately associated with such work, I find myself limited in the choice of a topic around which to gather a few thoughts for this occasion.

In the address of our former chairman we were shown with great clearness the beautiful vista that bacteriology and its kindred sciences have cut through the traditions and practices of the past in reference to infectious diseases. He brought us from the time when plagues were so numerous that it seemed almost that men were born to die of them, to a time when we are born into a knowledge of their cause and means of prevention. It would seem from what has been done that the secret had been found, and the organization of the work of the section and its scope were complete and perfect. It would further appear that through the munificence of so-called sanitary science we had passed beyond the horrors of pestilence to the glory of a mastery of infection were it not for the solemn facts that epidemics and epizootics do exist, sporadic, unexplainable cases of nearly all known infections are constantly being encountered, and new maladies are ever being brought to our recognition. In addition to this we are told that over 30 per cent of the deaths between the ages of 20 and 30 are caused by preventable diseases. These tell us in terms of no uncertainty that we have still other work to do.

From the very nature of the purpose that brought into existence board of health laboratories, the work of the laboratory men has largely been the formulating and carrying out of methods for aiding the health officials in the control of infectious diseases. While it is easy at this time to wonder because of the omissions, no one familiar with the multitudinous difficulties encountered by laboratory workers as well as those trying to enforce better ordinances, can speak other than in terms of highest commendation of the results already obtained. It has been said, "that the easy things are done." Certainly the work of this Section in formulating efficient and standard methods for aiding various routine for the laboratory worker and the extending of our usefulness by way of bringing within control that which is now lost is a complex problem not to be solved in a symposium of idleness or of speculation.

We have come together for the sixth time to discuss the varied lines of work of the Section, to compare notes as it were on the methods now in vogue, in order to ascertain how the weak places may be made strong and the accurate procedures may be made even more effective. We have survived the vicissitudes of beginnings and have been operating for two years under our new constitution. We have become organized into a scientific body for the purpose of applying biological and chemical sciences to the bettering of the physical existence of mankind. The chasm that was formerly supposed to exist between pure science and practical work has been bridged. The Section is not only well organized under its constitution but through the efforts of our publication committee, we have a means of promptly bringing before the world in a most auspicious manner the papers presented at our meetings. It seems fitting therefore, that at this time we should pause and consider the aims of the Laboratory Section in its capacity of a scientific society, as well as its filial relations to the general Association and its obligations to the public. Both pure and applied sciences are advancing with such leaps and bounds that it behooves us to have a definite plan of operation, to have a definite policy to maintain, and a specific object to work to. If we fail to do this, I fancy it may not be long before many of the results necessary to the fulfilment of the purpose for our existence will be recorded by others leaving us a more or less rusty machine for routine.

As I interpret our constitution, the function of this Section is threefold — routine, instruction, research.

The first is the development of routine laboratory methods, based on recognized facts, that will best serve the effort to protect human life. The formulation and standardization of methods for laboratory routine must of necessity be left to those who are actually engaged in the work. Our records show that this part is being well cared for. The frequent inability because of financial limitations to carry out desired systems or methods, or to retain tried and trusty assistance has led to serious hindrances in the past. This similar, and other difficulties will undoubtedly be overcome as the work of the laboratory becomes better known to the people and the real value of its existence is more fully appreciated.

The second duty is that of instruction. This is especially needed for the guiding of legislation concerning the control of disease in order that the public health laws will recognize in their application, the nature, which man cannot change, of the diseases they are to control. The men who by their training and studies are enabled to look deepest into the various processes of disease are of necessity the best fitted to command the forces that are to combat it. This is to be accomplished not by the manipulation of so-called politics or by usurping the rights of the executives but by presenting to the health officers and through them to those entrusted with the making of the laws the crystalized truth concerning the nature of the diseases in question. This calls for better work in the laboratories and a better knowledge on the part of the officials of the work that is, or that can, and should be done in the laboratories. In the mission that brought the American Public Health Association into existence and that which created the Laboratory Section there was but one objective point, the prevention of disease. This singleness of purpose requires that all considerations foreign to its accomplishment should be set aside. We in the laboratory often tend to impatience because of statutory and other obstacles to the extending and the accepting of the truths as they are revealed to us. We must not forget, however, that the health officials have their limitations and the lawmakers themselves their constituents. This seems to throw the responsibility largely upon the laboratory workers for it is to them that the people are looking for the truth in these matters. It has so happened, in reference to comparative pathology at least, that these very lawmakers and their constituents have met with gross injustice in the name of science. With such a condition we cannot help experiencing some sympathy for them in the spirit of the aphorism, "if a man deceives me once it is my misfortune, but if he deceives me twice it is my fault." It is not difficult to understand that laws and regulations based on an erroneous interpretation of but fragmentary knowledge have become potent factors in opposition to the desired enactments framed in accordance with a more perfect understanding of the nature of the diseases to be controlled. While perhaps this condition holds more strongly in comparative than in human sanitary work, the fact I believe remains that one of the important, and at this stage of our development, perhaps the most difficult of the duties of our laboratory men is that of instruction. As Minot has said, "knowledge lives in the laboratory." Frequent, free and full conferences between the laboratory men and the health officers will undoubtedly do much to harmonize with the laboratory findings the laws and ordinances to be enacted. It is by bringing to the general knowledge of the people the revelations of the processes of disease and methods for their prevention, that have been made possible through the application of exacting laboratory methods, that we discharge our duty to our parent organization and much of our obligation to the public. Our essential mission in this connection is to put to rout groundless traditions, to brand propaganda, and to direct the masses to the exact knowledge respecting the cause of disease and methods for its prevention.

The third duty, as I see it, is research to release from the great quarry of the unknown as many new facts as possible concerning the nature of disease, thereby causing continual changing and readjusting of routine and ever increasing its usefulness. It is this phase of our labors that I desire to emphasize most. So complex are the duties of the public laboratories, that the question of adding a third task to the already overworked force may appear to some to be unbearable. The primary reason for the creation of our laboratories may have been simply for the purpose of routine examinations to aid the health officer. This mission we are preeminently maintaining as our reports bear witness. The policy to instruct is operating for mutual good. Can these two functions continue without the third — the results of research?

We are met with the question, is it the duty of the men in the laboratories connected with public health service to make investigations or to do research work? I am aware that there are arguments pro and con to the answer to this question whether it be yes or no. It has been said that the university and especially endowed institutions, such as the Carnegie and Rockefeller, should look after the research, and that laboratories supported by the public should deal solely with the practical application of facts already determined. Within certain limits that is undoubtedly true. However, we are constantly facing conditions that suffering humanity is demanding should be changed. Before that can be done, it is imperative that we have the results of many careful inquiries. These inquiries cannot readily be delegated to others because the guiding light to the solutions of the problems is the experience with the conditions and the insight that the laboratory man has derived concerning them by virtue of his associations with them. This enables him to detect the exact questions to be answered. More than this, it is difficult to understand how it is possible for laboratory men to do efficient work without the stimulus of diligent inquiry, at least into the problems peculiar to their field of study.

Simple routine tends to the spirit of bondage. Personally I am convinced that the best balance wheel for every laboratory man is the carrying out of a series of careful and thorough investigations, or, better perhaps, the undertaking of some important research.

In this connection I am constrained to call attention, by way of suggestion, to a group of topics that appear to come within the jurisdiction of this Section that may, when fully elucidated, have some bearing, perhaps a remote one, upon some of the troublesome questions that arise in connection with a very considerable number of cases and conditions that a too rigid adherence to usual methods leaves in doubt. Further than this, it seems well for us to consider the influence upon sanitary measures of findings outside of the strictly speaking "board of health curriculum." It was a wise man who said, "we cannot use science until we know it." It so happens, that methods useful and munificent become more and more efficient with the changes resulting from the advent of every new truth in the realm of etiology. The questions that appear to be of much importance, especially in the educational part of our work, are those concerning the various modes of infection with a number of diseases, the significance of local bacterial flora, the evolution of pathogenesis in bacteria, and a rational explanation for the unusual phenomena of infectious diseases. These are by no means new, but the problems of twenty years ago are not all solved. While these topics are being almost overshadowed with the results of newer discoveries in serum therapy, immunity, lysins and the like, they are nevertheless very significant in the effort to explain the nature of many abnormal conditions that we are trying first to understand and then to prevent. Although much is known concerning infection, and many of the channels through which the invading organisms gain entrance to the animal body are known — we are not able as yet to explain just what these channels are in all cases.

The science of bacteriology has not aged sufficiently to have demonstrated the specific purposes concerning all the subtle workings of the as yet little understood microorganisms. The minds of men have been too nearly saturated with the philosophy that dominated medicine before there was a specific etiology, for them to have given the necessary attention to all the phases of microbiology suggested by the discovery of the specific nature of the great plagues. If I mistake not, the workings of many boards of health indicate that they still adhere with wonderful tenacity to the time honored theory of the older pathology "that disease is an entity." Although this is all changed, it is no less true, that the sanitary possibilities based on the newer pathology are not entirely understood or accepted by the laity. The facts that diseases are natural products of natural causes, that their study belongs with the biological sciences, that the living causes of the infectious ones are endowed with susceptibility to environment and the instinct of the perpetuation of their species, are for us to elucidate until the truth concerning them is made clear. There are many disharmonies between the knowledge found in the laboratory and the guiding traditions nourished by the masses. It is because of this, that I have made bold to emphasize the educational side of our Section work. In this connection it is likewise significant that we should see to it that the men taken into our laboratories as assistants should be qualified by way of a training in biological sciences to take up the work before them.

It is difficult to bring about a popular conception of the idea of the parasitism of the infectious diseases. We hear much of the horrors of tuberculosis, the gradual giving away of the physical forces of the infected, but do we consider in that connection the joy that has come to millions of tubercle bacteria that are gaining supremacy? Can we understand the real significance of this parasitism, and hold a controlling power over the parasite, if we do not see in the struggle two contending vital forces? Modern bacteriology began with a study of these highly specialized, pathogenic forms. We knew of the tubercle bacillus before we knew there was an acid fast group of bacteria; we knew of the comma bacillus before we knew of the spirilla in river water; we knew of the typhoid bacillus before we knew there was a colon group. Because of this, inquiries naturally tended more towards the acquiring of a better knowledge of these specialized forms, both within and without the body, than to the possible significance of the weaker members of the groups to which we now know they belong. Or, further still, to the environmental conditions which tended to bring about the many bacterial parasitisms to which the animal kingdom is heir.

The question where do these pathogenic bacteria come from is a very common one by thinking students, sanitarians and those sorrowing because of their existence. The question appears to be easy to answer in the presence of a wide spread epidemic that has its origin readily traced to some introduced case or cases. But is it always easy? Seriously, the time seems to have come when science must meet this question, not that she can answer it definitely or correctly at once, but because the progress in truth seeking concerning the nature and cause of disease has brought about that general condition of the intellect described by Huxley when he said, "the mind is so constituted that it does not willingly rest in facts and immediate causes but seeks always after a knowledge of their remoter links in the chain of causation." It seems, therefore, that as devotees of a science which holds its essential purpose to be the prevention of disease, that we must treat the frank and open questions concerning the source of its causative factors with at least a dignified respect. If we are to formulate an answer to this question, we have but one choice which rests, not in the special creation of the older theory, but in the activities and tendencies of living creations formerly known as natural selection. It was under the influence of the belief that the infectious diseases were either of spontaneous origin or caused by special visitations of supernatural powers that boards of health were originally organized and made operative; but it is under the greater influence of the laws of evolution that modern scientific methods are seeking to replace the empiricism of the past with the simple truths of existing, ever changing manifestations of vital forces as exhibited in specific pathology.

A rational explanation for a very considerable number of the pathological conditions that now rest in the questionable zone between known infections and noninfections; the relation, if any, between sporadic cases and well defined epidemics and epizootics, and the proper handling of various intestinal infections and the pneumonias are but a few of the problems that are waiting at our doors for solution. These belong to the laboratories of the Section for they are in touch with the conditions and with the material. As illustrative of the value of this research work, I have but to mention that of the diphtheria bacillus. While Wesbrook, Hill, Smith, Denny and many others will have the enduring gratitude of generations of laboratory workers, the thousands who have been saved because of a greater knowledge of this organism in diagnosis will speak, if they can but know the facts, for similar work productive of like results in other lines.

Perhaps the most striking illustration of formulated evidence on the gradation and perhaps evolution of pathogenesis in bacteria is found in the work on the septicaemia hemorrhagica group by Lignieres. He has discovered that certain members of the pasteurella exist with less and less virulence even to becoming saprophytes in external nature. This interesting discovery throws so much light on the pathogenic possibilities of other groups of bacteria that it deserves a brief consideration. Loeffler and Schutz found a member of this group of organisms to be the cause of an infectious pneumonia in swine. Smith discovered it in the upper air passages of healthy swine. Later it was found in the larynx and trachea of a certain percentage of normal horses, cattle, sheep, cats and dogs. It was not discovered on other mucosa but was localized in the throat. These organisms showed a wide variation in virulence but not more so than those found in various diseases caused by the pasteurella. The discovery of Lignieres goes a step further into the mystery of nature and points to this species as a simple saprophyte. Prior to this, both Sternberg and Pasteur had found the bacterium of sputum septicaemia or as it is better known *Micrococcus lanceolatus* in the normal saliva of healthy persons. The literature contains many articles on the existence of bacteria localized, and to that extent parasitic, on the mucosa and skin of healthy individuals that exhibit marked pathogenesis when inoculated into animals.

The essential objection to the acceptance of Lignieres findings is that the virulence is not varied in the organisms of a single culture. In 1894 a series of experiments were published in a bulletin of the Bureau of Animal Industry of the United States Department of Agriculture in which it was shown that rabbits partially immunized to the bacterium of swine plague by the use of sterilized cultures would, when inoculated with very virulent cultures of the same organism, live for a considerable length of time and die with modified lesions containing the organism in an attenuated state. This loss of virulence was restored by passing it through a series of susceptible rabbits. From these and other experiments a simple formula was derived for expressing the influence of resistance or susceptibility of the host upon the virulence of the parasite and likewise the effect of these influences upon the character of the resulting lesions. More recently Smith has explained the more intimate relation existing between the parasite and the host in the evolution of perfect parasitism and in the development of immunity.

For a number of years, I have been applying and testing the formula without finding it wanting. The formula is expressed simply, the disease in the host equals the virulence of the parasite over the resistance of the host. As virulence or resistance vary the character of the lesions change. Likewise it seems that the resistance of the host not only modifies the lesion but it exerts an appreciable influence upon the virulence of the infecting organism. This law which seems to obtain in the struggle for the survival of the fittest in certain infections gives us a key to the understanding of many of the otherwise anomalies in morbid anatomy, variation in the duration of infection, and changes in the virulence of pathogenic organisms, all of which enter very forcefully into the interpretation of pathological conditions to be explained in our laboratories. These are conditions that often baffle the usual routine and stereotyped conception of infection and which cause health officers much trouble for frequently the manifestations of disease are not in harmony with the ordinances they are trying to enforce. Although such cases may be rare, they are the ones, the proper handling of which center the attention of the medical profession as well as the laity upon the work of our health officials and thus they afford a crucial test by which the executive measures the value of his laboratory advisor.

After this brief glance at the pathogenic gymnastics of the pasteurella, it is less difficult to reconcile ourselves to the other findings along similar lines. In a recent excellent work on pathology we find this statement concerning *Micrococcus pyogenes aureus.* "it is possible that under normal conditions it is devoid of virulence and acquires pathogenic properties only when abnormal conditions arise." The study of the bacterial flora of the skin of both man and beast shows that this leader of infection is not an infrequent inhabitant of the epidermis. Whether it has become a strict parasite, without a normal habitat elsewhere in nature has not been determined.

Another interesting discovery in reference to bacterial flora is that of Bauermeister. He has reported a bacteriological examination of the throat or tonsils of 140 healthy swine with the astonishing result that the bacterium of swine erysipelas was present in every case. Thus the virus of another destructive disease has been found apparently as the normal inhabitant of the normal mucosa. In view of the natural distribution of these organisms the significance of their presence in isolated or sporadic cases is not always easy to interpret, especially in the presence of a law that will enforce the hardships of a quarantine if the disease is identified with the organism.

Although these illustrations are drawn from comparative pathology the diseases involved are often under the supervision of boards of health. It is not difficult to find analogies in human pathology, but after ali, in the war against disease we must deal with the animal body as the host regardless of its species or social condition.

In these fragmentary remarks, I have attempted nothing beyond a few suggestions concerning the various lines of work of the Section. It is our duty to find and to tell the truth, no matter what it is so long as it be true, of the story of infection and disease. No matter from what point of view the laboratories are considered, they must of necessity reveal the facts for the rationale of the public health laws and regulations. We are an organized part of the general Association, and as such we must cheerfully assume our full responsibility. In this battle with disease, we must join hands with those venerable and distinguished gentlemen who are giving their years to the service of public health. They saw the necessity for our existence and they made our laboratories possible. These health officers and officials who came to realize that in the new generation was hope for the solution of the problems immediately before them, typify progress in the world. Many of the problems before us are as unsolvable by our present knowledge and methods as was the checking of the great plagues by those of the ancients. We are anxiously looking for more exacting and far-reaching methods for finding answers to the present questions. If we do not find them, we have faith to believe that they will be found, and will continue to be found, until eventually, the victory over disease will be won, and the attainment to a "physiological old age" will be the rule, not the exception, among mankind.

EMIL ALEXANDER DE SCHWEINITZ, BORN 1864, DIED 1904.

Dr. Emil Alexander de Schweinitz was born in Salem, North Carolina in the year 1864. He was a son of Bishop de Schweinitz of the Moravian Church, and a grandson of the Rev. Lewis David de Schweinitz, who is well known on account of his many additions to our knowledge of fungi and other plants in the United States.

Emil Alexander de Schweinitz received his early education at the Nazareth Hall High School and the Moravian College of Bethlehem, Pennsylvania, and subsequently entered the University of North Carolina from which university he received the degree of Doctor of Philosophy. From the University of North Carolina he went to the University of Berlin, and later entered the University of Göttingen, receiving from the last named institution the degree of Doctor of Philosophy. He was not married.

During the time spent in Germany the greater part of his labors were devoted to the study of chemistry and allied subjects. Upon returning to the United States he was engaged to teach chemistry in Tuft's College, Massachusetts, and after a short while was made Professor of Chemistry in the Agricultural and Mechanical College of Kentucky. In 1888 he received an appointment as an Assistant in the Division of Chemistry of the United States Department of Agriculture. On January 1, 1890, he was transferred from the Division of Chemistry to the Bureau of Animal Industry in the Department of Agriculture, and placed in charge of the biochemical researches which were begun by the last named Bureau on that date. The work along these lines increased so rapidly that a separate Division of Biochemistry in the Bureau of Animal Industry was created and Dr. de Schweinitz was placed at its head. This position he occupied until the day of his death.

After entering the Bureau of Animal Industry his labors were confined almost entirely to research work concerning the metabolic products of disease-producing bacteria, the chemical composition of the bodies of these bacteria and the production of immunity therefrom. Owing to the special interest of the Bureau of Animal Industry in those diseases which attack the domesticated animals, his attention was directed in great part to the study of the etiology, the treatment of, and the methods of protection from such animal scourges as tuberculosis, hog cholera, swine plague and glanders. His most important contributions to science were probably those which dealt with the production of immunity from tuberculosis. While not the first to note a successful vaccination of laboratory animals against this disease, he was the first to record the use of attenuated human tubercle bacilli for the production of immunity from tuberculosis in cattle.

In the later years of his life he had given much time and energy to the production of a suitable vaccine for hog cholera. At the time of his death he had almost completed extensive experiments dealing with the intertransmissibility of human and bovine tuberculosis. These experiments, which will be published in the near future, should form most important aids in the solution of this widely discussed question.

Dr. de Schweinitz was elected to membership in the American Public Health Association in 1896 and was also a member of the Section of Bacteriology and Chemistry from the time of its organization, having served on the council and various committees of the section.

He was several times vice-president of the international congresses on tuberculosis and hygiene which were held in Paris and Berlin, and his research work was well known and highly regarded abroad as well as in the United States.

In addition to the duties which Dr. de Schweinitz performed as Chief of the Biochemic Division of the Bureau of Animal Industry, he was Dean of the Medical School and Professor of Chemistry and Toxicology in that department of the Columbian University. In 1895 that institution conferred upon him an honorary degree of Doctor of Medicine.

A complete bibliography of his writings has been prepared by Dr. Charles Wardell Stiles and may be found in the Columbian University Bulletin No. 1.

His death, which was caused by uremia, took place on February 15, 1904, and came as the greatest shock to his co-laborers and friends. The Bureau of Animal Industry has lost a faithful and highly honored official and medical science has lost an investigator who did much towards clearing up the little-known paths of chemical pathology. We honored him for his scholarly achievements, and we mourn his loss as that of a friend and an investigator who was cut off in the midst of his labors. As brilliant as was his past work, the future promised even greater achievements. It can be truly said that the world is better and wiser for having known him.

M. DORSET.

REPORT OF THE COMMITTEE ON THE RELATION OF PROTOZOA TO DISEASE: IN PARTICULAR "AMOEBA COLI."

BY CH. WARDELL STILES, PH. D., WASHINGTON, D. C.

CHIEF OF DIVISION OF ZOOLOGY, U. S. PUBLIC HEALTH AND MARINE HOSPITAL SERVICE, CHAIRMAN OF COMMITTEE.

This committee was not aware of its own existence until its report was called for, hence it has not been systematically at work during the year, and, when finally called upon for its report, the duty of this work was assigned to the chairman.

The committee is composed of the following members: Ch. Wardell Stiles, chairman; James Carroll, G. E. Beyer, L. B. Wilson.

The protozoa continue to attract an increasing amount of attention on account of their practical importance in medicine.

The medico-protozoan subjects which have recently excited the most interest are: (1) The amebæ in man, in relation to amebic dysentery; (2) the life-cycle of *Trypanosoma noctuae,* as studied by Schaudinn; (3) the cultivation of trypanosomes, as successfully accomplished by Novy; (4) the demonstration of a trypanosomatic disease in man in Africa, and the relation of the parasite to sleeping sickness; (5) the studies of Schaudinn upon *Spirochaete ziemanni* of the sparrow owl, its life cycle, and the demonstration of its close affinities to *Trypanosoma;* (6) the studies of Schaudinn on malaria, demonstrating parthenogenesis of the macrogametes as cause of recidivation attacks of malaria, and his claim of demonstration that malaria is hereditary in the mosquitoes; (7) the presence of a peculiar protozoon, known as *Leishmania,* in cases of tropical, non-malarial splenomegaly.

THE PRESENT STATUS OF "AMOEBA COLI."

General remarks upon amebae.—In order to better understand Schaudinn's work on the amebæ parasitic in man, let us recall certain historical facts.

Linnaeus (1758, p. 821) proposed the genus *Volvox* with two species, *V. globosus* and *V. chaos.* The latter specific name was intended for "der kleine Proteus" of Roesel (1755, p. 622, pl. 101, figs, a-t), which is generally admitted to be *Amoeba proteus* of recent authors. Later, Linnaeus (1767, pp. 1326-1327) proposed the genus *Chaos,* to include the following species:

(1) *Chaos redivivum* Linnaeus, 1767, which is now usually known as an *Anguillula*;

(2) *Chaos protheus* Linnaeus, 1767, which is *Volvox chaos* Linnaeus, 1758, and *Chaos proteus* Pallas, 1766, renamed;

(3) *Chaos fungorum* Linneaus, 1767;

(4) *Chaos ustilago* Linnaeus, 1767;

(5) *Chaos infusorium* Linnaeus, 1767.

In determining the type of this genus we should be governed by two principles: *first,* the Linnaean principle, "Si genus receptum, secundum jus naturae et artis, in plura dirimi debet, tum nomen antea commune manebit vulgatissimae et officinali plantae;" second, the principle of *absolute tautonymy,* according to which *Volvox chaos* became *ipso facto* type of the genus Chaos, when Linnaeus raised the specific name *chaos* to generic rank. By the Law of Priority, *Chaos chaos* is therefore the correct name for the organism now generally known as *Amoeba proteus.*

Mueller (1786) proposed *Proteus* as generic name for the group represented by *Chaos chaos,* but this was inadmissible on two grounds: *first,* it was a renaming of a previously named genus, the earlier name of which was valid; *second, Proteus* was used for a genus of reptiles in 1768, hence the name was preoccupied.

Bory (1822, pp. 261-262) proposed the generic name *Amiba* (changed by Ehrenberg, 1830, pp. 59, 95, to *Amoeba,* and by some later authors to *Amoeba* and *Ameba*); he designated Roesel's, 1755, organism as type, hence the genus *Amiba* is based upon the same organism as *Chaos,* and it is therefore a synonym of the latter.

The generic synonymy for *Chaos* stands as follows:

Genus *CHAOS* Linnaeus, 1767.

1767: *Chaos* Linnaeus, 1767, pp. 1074, 1326-1327. Type *Volvox chaos* Linnaeus, 1758.

1786: *Proteus* Mueller, 1786, p. 9. [Not *Proteus* Laur., 1768, reptile.]

1822: *Amiba* Bory, 1822, pp. 261-262. Type, der kleine Proteus of Roesel, 1755, equals *Volvox chaos* Linnaeus, 1758.

1830: *Amoeba* Ehrenberg, 1830, pp. 59, 95. *Amiba* renamed.

1843: *Amorba* ———.

1848: *Amoebea* Gross.

1901: *Ameoba* Schaefer. [Probably misprint.]

——: *Amoeba* and *Ameba* of various authors.

I have not been able to verify all of the references to the type species of this group, but *judging from the literature references,* the synonymy of this species stands as follows:

CHAOS CHAOS (Linnaeus, 1758).

1758: *Volvox chaos* Linnaeus, 1758, p. 821. Binomial for "der kleine *Proteus*" of Roesel, 1755.

1766: *Volvox proteus* Pallas, 1776, p. 417. Binomial for "der kleine *Proteus*" of Roesel, 1755.
1767: *Chaos protheus* Linnoeus, 1767, p 1326. *Volvox chaos* 1758 renamed.
1773: *Volvox sphaerula* Mueller, 1773, p. 31. Includes Roesel's Proteus, 1755.
1786: *Proteus diffluens* Mueller, 1786, p. 9.
1788: *Vibrio proteus* (Pallas, 1766) Gmelin, 1788, p. 3899.
1822: *Amiba divergens* Bory, 1822, p. 261. New name for Roesel's Proteus 1755.
1824: *Amiba Roesili* Bory, 1824, p. 46. New name for Roesel's Proteus 1755
1824: *Amiba Muelleri* Bory, 1824, p. 46.
1830: *Amoeba diffluens* (Mueller, 1786) Ehrenberg, 1830, pp. 59, 95.
1838: *Amoeba princeps* Ehrenberg, 1838, pp. 28, 79.
1841: *Amiba princeps* (Ehrenberg, 1838), Dujardin, 1841, p. 232.
18—: *Amoeba ramosa* Fromentel, p. 346.
1877: *Amoeba communis* Duncan, 1877, p. 233. *Amoeba princeps* renamed.
1878: *Amoeba chaos* (Linnaeus, 1758) Leidy, 1878, p. 99.
1878: *Amoeba proteus* (Pallas, 1766) Leidy, 1878, p. 99.
1905: *Chaos chaos* (Linnaeus, 1758) Stiles, 1905.

From the above it will be seen that the generic name *Amoeba* now in general use for the common fresh water ameba, is not in accord with the rules of nomenclature. Authors who adopt the international Law of Priority and who believe in consistency in nomenclatural matters should adopt the generic name *Chaos* and the specific combination *Chaos chaos*. Authors who do not believe in consistency have open to them any of the generic names *Chaos*, *Proteus*, *Amiba*, *Amoeba* and *Ameba*, and he who prefers any one of these except the first is hardly in a position to criticise any man who prefers some other name or who concludes to introduce a dozen or more new names for a genus already named *Chaos* in 1767.

Turning now to the amebae parasitic in man, it may be recalled that Casagrandi and Barbagallo in 1897 claimed that *Amoeba coli* Lösch, 1875, and *Amoeba* (?) *blattae* Siebold, 1878, or *Amoeba blattarum* are not so closely related to the fresh water ameba, *Chaos chaos*, as has been generally supposed. In fact, they separate from *Amoeba* (=*Chaos*) these two species and base upon them their new genus *Entamoeba*. Schaudinn agrees with Casagrandi and Barbagallo in this view and recognizes *Entamoeba* as a valid genus. Craig[1] (1904, pp. 299-301), however, rejects the name *Entamoeba* and upon basis of the Law of Priority adopts the name *Amoeba*. He has, however, overlooked the fact that if he considers "*Amoeba coli*" congeneric with "*Amoeba princeps*" and holds to the Law of Priority, as he claims he should, he should also reject the generic name *Amoeba* and adopt *Chaos* for the parasite of man.

Personally, I at present accept *Chaos* for amebae of the type *Chaos chaos*, namely the fresh water form, and *Entamoeba* for parasitic forms such as "*Amoeba coli* Lösch."

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[1] Addition during proofreading: Craig (1905) has since adopted *Entamoeba*.

Turning now to the nomenclatural history of the amebae parasitic in man we see that Lösch was the original proposer of the name *Amoeba coli* in 1875. Councilman and Lafleur (1891) disapproved of this name, considering that it was not appropriate, and proposed the new name *Amoeba dysenteriae*. With them this was not a question of claiming that the form they studied was specifically distinct from *Amoeba coli,* but simply a personal preference for *dysenteriae* over *coli.* Such grounds are not considered sufficient by zoologists to justify the proposal of a new name, and according to the rules of nomenclature, *A. dysenteriae* is a synonym, pure and simple, of *A. coli,* regardless of the fact whether the organism studied in Baltimore was identical with the parasite Lösch described and named. Kartulis, 1893, used the term *Amoeba dysenterica* in connection with an ameba which he found in man in Egypt, but he has stated in conversation to Schaudinn and me that this name is only accidentally binominal, and was not intended as a name in the nomenclatural, zoological, sense, hence this combination falls out of further consideration. This same combination (*Amoeba dysenterica*) was also used by Goldsmith (Australia) in 1901, November 15, for an ameba found in the mucus of stools in a certain type of tropical dysentery. It is not clear from his context that he considers this identical with *Amoeba coli.*

Amoeba coli mitis Quincke and Roos, 1893, was found in a patient at Kiel, Germany, and described as distinct from *Amoeba coli.* Quincke and Roos do not write in accord with the binomial system of nomenclature, and hence the names they use need not be considered in determining the correct designation of the species found in man.

Amoeba intestini vulgaris Quincke and Roos, 1893, was found in nine out of twenty-four healthy persons examined, to whom Karlsbadersalz had been given. It was interpreted as a non-pathogenic species, distinct from *Amoeba coli,* but very similar to *Amoeba coli mitis.* The name is not in the spirit of the binomial system, hence it has no nomenclatural status.

Amoeba intestinalis Blanchard, 1885, was proposed for parasites Sonsino reported from Cairo, from the intestinal mucus of a child who was suffering from dysentery, and assumed by Blanchard to represent a species distinct from *A. coli.*

Celli and Fiocca, 1894, report three varieties of *Amoeba lobosa* from man, namely, *A. lobosa guttula*, *A. lobosa oblonga*, *A. lobosa coli;* they also report for man *Amoeba spinosa*, *A. diaphana*, *A. vermicularis,* and *A. reticularis.*

Other names used for amebae reported for man are: *Amoeba coli felis* Quincke and Roos, 1893, supposed to be identical with *A. coli;*

Entamoeba hominis, proposed by Casagrandi and Barbagallo, 1897, as a new name for *Amoeba coli; A. Kartulisi* Döflein, 1901, reported by Kartulis (1893) in a submaxillary abscess; "*Amoebea gengivalis*" Gros, 1849, reported from the inner surface of the teeth; *Amoeba buccalis* Steinberg, 1862, reported from tartar on the teeth; *Amoeba dentalis* Grassi, 1879 (afterwards thought to be saliva-corpuscles); and *Amoeba urogenitalis* Baelz, 1883 (=*A. vaginalis* Blanchard, 1885.)

From this list it may be seen that the determination of the correct name for the ameba found in man is rather a difficult matter. If only the question of priority were involved, *coli* would undoubtedly be the correct specific name to adopt. But the matter is complicated by the view that different species are present, at least one of which is pathogenic and at least one non-pathogenic. The most important variations in views upon this latter point may be briefly summarized as follows:

1. That the amebae in man have no pathogenic properties, hence are not the cause of amebic dysentery. (Cunningham, Grassi, Celli and Fiocca, Casagrandi and Barbagallo, and others).

2. That the amebae are the cause of a specific malady known as amebic dysentery. (Kartulis, Councilman and Lafleur, Osler, Strong, and others).

3. That amebae are able to keep up a pre-existing inflammation. This was the original view advanced by Lösch when he described the most commonly cited form, *Amoeba coli,* and several authors have followed Lösch in this opinion.

4. That more than one species of amebae are found in man; at least one is pathogenic, at least one is non-pathogenic. (Quincke and Roos, Strong and Schaudinn).

5. That data advanced up to 1893 did not give grounds for believing that authors have been dealing with more than one species of amebae in man; that it is probable that amebae are exceedingly common, if not regular, as commensals (harmless parasites), in the colon; that they are not found in normal stools since acid reaction kills them, but are found only in thin, alkaline, abnormal stools, hence are found not only in so-called amebic dysentery but may be met with in other diseased conditions in which the stools become abnormal. (Schuberg).

6. That bacteria produce the first lesions, and that the amebae then spread pathogenic bacteria by entering the lesions. (Döflein).

For those authors who maintain that only one species of ameba is present in man, and that this species is not congeneric with *Chaos chaos,* it is clear that the correct name for him to use is *Entamoeba coli* (Lösch, 1875), regardless of his view concerning the pathogenicity of this species.

For those authors who maintain that two species are present, one pathogenic, the other non-pathogenic, it is important to determine who first correctly fixed the specific names for the two forms, since to that author belonged the privilege of determining whether the name *coli* should go to the pathogenic or to the non-pathogenic species, as the problem practically presented was the division of a systematic unit recognized as of specific rank into two systematic units of specific rank.

So far as my recollection serves me, Strong (1901) is the first author who comes into consideration, Quincke and Roos (1893) as already stated were not consistently binomial, hence their names need not be considered.

Strong (1901) confined the name *Amoeba coli* to the non-pathogenic species, and adopted *A. dysenteriae* for the pathogenic form. In his first ruling, Strong was entirely within the Code; he ruled further in the spirit of Lösch's original publication, and his action fixes the point for all time to come. In his selection of *dysenteriae* for the pathogenic species, Strong committed a formal error. It has been shown above that *dysenteriae* was proposed as a *substitute* for *coli*, hence it must remain a synonym of *coli*. It therefore remains to fix the proper specific name for the pathogenic form. In this, however, we have a somewhat complicated problem for we do not at present know the relations of the pathogenic amebae of different parts of the world to each other. Thus, it seems as if the name *intestinalis* Blanchard, 1885, may perhaps be available for the pathogenic form found in Egypt; the availability of the names used by Celli and Fiocca, 1894, for the pathogenic form found in Italy is a matter for debate, as is also the case with most, if not all of the other names mentioned; *dysenterica* Goldsmith, 1901, is very probably available for some pathogenic form found in Australia.

Schaudinn (1903), although apparently unacquainted with Strong's paper, ruled in the same sense as Strong, namely that the specific name *coli* should be restricted to the non-pathogenic species, while he proposed *Entamoeba histolytica* as name of the pathogenic species.

In Schaudinn's paper, we find much more definite statements concerning the parasite than in any of the other cases, but the question arises whether *histolytica* is identical specifically with *intestinalis* of Africa, or *dysenterica* of Australia, for it is by no means established that there is only one species of pathogenic ameba found in amebic dysentery. The various points at issue can be determined only by a comparison of slides from different parts of the world, and as Schaudinn has undertaken such a comparison, I believe it in the interests of conservatism to adopt provisionally the name *Entamoeba histolytica* for the pathogenic form, awaiting the further results of Schaudinn's study, when it may be necessary to revert to ***intestinalis***, or ***dysenterica***.

Schaudinn's work[1] ***upon the ameba parasite in the human intestine.*** As already intimated, Schaudinn (1903) recognizes two species of amebae in the human intestine; he considers them generically distinct from the fresh water amebae (*Chaos chaos*), and places them in the

GENUS ENTAMOEBA CASAGRANDI AND BARBAGALLO, 1897.

He names the nonpathogenic species *Entamoeba coli*, and the pathogenic species *Entamoeba histolytica*. Unfortunately his illustrations of these two species are not yet published, so that it is a little difficult to follow his work.

He calls attention to the wide spread belief among physicians that the group of amebae represents a definite zoological entity, yet that as a matter of fact it is more or less of a catch-all for a number of forms which in reality represent only developmental stages of various organisms. Linnaeus' generic name *Chaos* was not based upon the chaotic state of this group as we see it to-day, but the name was well chosen even from our present standard. Further study of the group will doubtless make radical changes in present views concerning the classification and biology of the organisms usually interpreted as its representatives. Probably the rhizopods which are provided with shells represent a more natural group than the naked forms, and on this account the shelled species present the best forms for fundamental investigations, in order to gain data which will aid in interpreting the parasitic forms. Accordingly, Schaudinn first discusses the species known as *Polystomella crispa*, *Centropyxis aculeata*, and *Chlamydophrys stercorea*. The latter species is especially interesting as representing a rhizopod which after the sexual act forms a resting cyst (Dauercyst); this cyst must pass through the intestinal canal of man or some other mammal in order to develop further; in the large intestine of man an ameboid stage escapes from the cyst, assumes the shelled stage in the discharged feces, and passes through a complicated development. Beside this species, other ameboids occur in the human intestine and thus render a study of the intestinal amebae more difficult; thus, *Trichomonas* loses its flagella before copulation and is then distinguished with difficulty from true amebae, since it crawls around by means of short, blunt pseudophodia.

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[1] Schaudinn, Fritz, 1903 — Untersuchungen über die Fortpflanzung einiger Rhizopoden. (Vorläufige Mitteilung). [Preliminary communication on the reproduction of some rhizopods.] Arb. aus d. Kaiserl. Gesundheitsamte, Berlin, v. 19 (3), pp. 547-576. [MS. dated Dec. 20, 1902.]

The non-pathogenic ameba of man is

ENTAMOEBA COLI (Lösch, 1875) Schaudinn, 1902.

SYNONYMY.

1902: *Entamoeba coli* (Lösch, 1875) SCHAUDINN 1903, p. 564, 565-570. *coli* of probably most if not all authors. Confined to the non-pathogenic species by Strong (1901) and Schaudinn (1903).
1891: *Amoeba dysenteriae* COUNCILMAN AND LAFLEUR. *Amoeba coli* renamed.
——: *Amoeba coli* and *Ameba coli* of various authors.
1897: *Entamoeba hominis* CASAGRANDI AND BARBAGALLO. *Amoeba coli* renamed.
1902: *Entamoeba coli* (Loesch, 1875) SCHAUDINN, 1903, p. 564, 565-570.

Grassi (1879, 1882) was apparently the first to find this species in healthy persons. Schuberg (1893) found it in several persons after giving salts. Schuberg (1893) and Casagrandi and Barbagollo (1897) reviewed the literature up to the date of their publications.

Schaudinn (1903, p. 565) found it in 34 out of 68 persons examined in Eastern Prussia, in 20 per cent. of the people he examined in Berlin, Prussia, and in 256 out of 385 persons examined in Rovigno, Austria. He infected himself with it experimentally on two occasions; once in Berlin, and once in Rovigno. Casagrandi and Barbagallo (1897) and Schaudinn (1903) succeeded in infecting young cats.

While the ameba is at rest in its vegetative stage (namely, in the form usually referred to as an ameba), the ectoplasm and the endoplasm are not distinguishable from each other; but when in motion, it is seen that the pseudopodium is at first hyalin and always remains less refringent and less chromatophilic than the rest of the body. The nucleus is globular, with tough nuclear membrane; in the center, in most of the vegetative stages, there are one or several small nucleoli of plastin and chromatin, while the chromatin is scattered in the form of fine granules through the achromatic net which fills the nucleus, and it is especially located on the nuclear membrane.

A. *Vegetative stage.*—The reproduction of the vegetative stage occurs in two ways: (1) by simple division, or (2) by schizogony, giving rise to 8 daughter organisms.

1. In the *simple division*, the nucleus divides amitotically, then the plasma divides.

2. In the *schizogony*, more complicated nuclear changes take place. The nucleus increases in size by taking in fluid, the plasma frees itself of all foreign substance, and movements cease. The chromatin separates into 8 rather large clumps on the periphery, which scatter in the protoplasm after the nuclear membrane dissolves and immediately the plasm divides into 8 small amebae which become independent.

Schuberg's (1903) idea that the vegetative amebae find suitable conditions for life in the normal intestine only in the upper part of the colon seems to be correct, as Schaudinn (1903, p. 566), convinced himself in several autopsies. Salts, however, bring them out (Schuberg, 1893; Schaudinn, 1903, p. 566). As the stools become thick, the amebae either die or, if the amebae are in the right stage, they form the

B. *Resting Cysts.*— The reproduction is somewhat similar to that of some of the Coccidia, in that it is non-sexual in the intestine, while the infection stage is preceded by a sexual act. The duration of the vegetative stage varies considerably, lasting longer in diarrheic stools than in healthy movements; accordingly, in fluid stools the cysts develop later; the thickening of the stools seems to favor encystation but is not always necessary for it.

Grassi discovered the cysts and Casagrandi and Barbagallo (1897) studied them carefully. They are very favorable objects for studying nuclei, and the half fluid stools are best. The plasma is clear and by artificial light the nuclei are nearly as sharp and distinct as in colored preparations.

(a.) The uni-nuclear ameba becomes globular or oval, expels all foreign substance and much fluid, contracts, and secretes an outer delicate, slightly refracting but rather thick gelatinous layer.

(b.) The nucleus now divides by primitive mitosis into two similar daughter nuclei, which wander to opposite poles of the cell; the plasma thickens around the two nuclei so that a clear space forms between them, dividing the plasma into two incompletely separated parts.

(c.) The organism remains in this condition for some time, the nuclei become less evident and finally can not be seen in the living object; but staining shows that the nuclei dissolve and give their peripheral chromatin to the plasma, which becomes quite darkly colorable and there remains of each nucleus only a finely reticular portion which is indistinctly defined from the plasma. From this is formed

(d.) A new nucleus which is smaller than the original nucleus and at first very poor in chromatin. The two nuclei now become visible in the living object but are small. There is some variation in the process of the reformation of the two nuclei, but in all cases a portion of the nuclear substance becomes lost while the nuclei are reconstructed from the residua. The variation stands in relation with the degree of development of the gelatinous covering, in that a portion of the nuclei is expelled in case the covering is not formed, but remains in the plasma when the covering is well formed.

From now on, the reconstructed nuclei remain recognizable in the living object, at opposite poles.

(e.) Both now divide, synchronously or nearly so by primitive mitosis, into two, so that the cell now has four nuclei, arranged in pairs at opposite poles. At each pole, one of the nuclei shrivels to a reduction-body, and

(f.) The other two nuclei now divide, each into two. We now have three nuclei at each pole. One of the new nuclei at each pole now degenerates into a bright reduction-body, leaving us

(g.) One normal nucleus at each pole. Now the true encystation begins; the plasma contracts and excretes a thin, refringent but tough membrane; the gelatinous covering is no longer present; the clear equatorial dividing zone has disappeared and the reduced nuclei are nearer each other.

(h.) Each nucleus now divides again (3rd division); the elongate spindles become parallel in the center of the cell; a daughter nucleus from each set now wanders to the opposite pole and

(i.) The two at each pole (1 from each set) coalesce, so that we now again find

(j.) Two nuclei in the cell. These now undergo two serial divisions,

(k.) By primitive mitosis, thus giving rise to eight nuclei. The cyst-membrane has become thicker. The division of the plasma does not take place until the cyst reaches the colon of the next host.

About 80 to 90 per cent. of the cysts perish in the feces before completing these changes and only the eight-nucleated cysts can be found. It is only this stage which is found in old dried feces.

The pathogenic ameba of man is

ENTAMOEBA HISTOLYTICA Schaudinn, 1903.

—: *Amoebi coli* in part, of some authors.
1891: ?*Amoeba dysenteriae* Councilman and Lafleur, in part. [U. S. A.]
1893: ?*Amoeba dysenterica* Kartulis [Egypt]. Not proposed as a zoological name.
1895: ?*Amoeba intestinalis* R. Blanchard, based upon Sonsino's observation in Cairo, Egypt; parasites, in mucus of diarrhea case, 55 to 70µ.
1901: ?*Amoeba dysenteriae* Councilman and Lafleur of Strong in Philippine Islands.
1901: ?*Amoeba dysenterica* Goldsmith in Australia.
1903: *Entamoeba histolytica* Schaudinn, in Europe.

In *Entamoeba coli*, the hyalin pseudopodioplasm is not sharply defined from the rest of the protoplasm and is less refringent; in *E. histolytica* there is always a distinctly developed ectoplasm present as a special plasma zone, and this possesses a greater power of refrangibility than the endoplasm. As Jürgens (1902) correctly recognized, it makes a "glassy" impression on the observer. This character of the ectoplasm accounts for the difference in the habits and effects, for the well developed ectoplasm of *E. histolytica* enables this form to burrow its way between cells and to wander around.

The nucleus of *E. coli* in life is clearly defined, contains smaller or larger refringent granules, and is always easy to find; in *E. histolytica*, the nucleus is always difficult to find, and is almost absolutely homogeneous, and faintly refringent. In stained specimens, the nucleus of *E. coli* is seen to be rich in chromatin; of *E. histolytica* it is only faintly stained, usually with only a single nucleolus in the centre and in addition a narrow peripheral zone of chromatin. In *E. coli* the nucleus preserves its form and is provided with a thick membrane; in *E. histolytica* the nucleus changes its form, an achromatic membrane can not be seen, and its location is always excentric.

A. *Vegetative stage.*— In the vegetative stage, Schaudinn observed both (1) division and (2) budding (single and multiple), but never a brooding into eight new individuals. Both the division and the budding are amitotic. The multiple budding (namely, budding of several young) takes place especially in the lumen of the intestine, while the division and single budding take place in the tissue.

B. *Resting stage.*— Jürgens did not find any resting stages. Schaudinn (1903, p. 572) has found the 8-nucleated resting stage present in some cases of infection with *E. histolytica,* but he was always able to prove that a double infection (with both species, *E. coli* and *E. histolytica*) was present. In pure infections with *E. histolytica* the 8-nucleated rest stage could not be found.

The resting stage of *E. histolytica* is very small, 3 to 7 μ, and not prominent in feces. Its formation takes place, as in so many protozoa, only when conditions become unfavorable. In this species, this corresponds usually with the beginning of the recovery from the disease. The resting forms appear only after the feces become harder, or possibly it would be more correct to say that, when the vegetative period of the parasite ends, recovery takes place.

The beginning of the preparation for spore formation first becomes noticeable in the nucleus; the peripheral chromatin zone of the nucleus gradually becomes broader, extending into the surrounding protoplasm and the definition of the nucleus becomes still less distinct than before. The nucleus then gives up large quantities of chromatin to the surrounding plasma. These chromatin particles, whose ejection from the nucleus may be followed step by step in stained specimens, are so increased that they finally fill the entire plasma in form of chromidia, while the nucleus itself degenerates. In live specimens it is noticed that the nucleus lies on the periphery, is much enlarged in size, and is usually in the form of a disk on the border of the ectoplasm; often it is entirely ejected, in that a plasma projection extends out with the nucleus and breaks off.

The peripheral ectoplasm, which is at first homogeneous, assumes here and there a fibrillated structure, the fibrillæ running parallel to the surface; these points form projections, with active plasma-motion, and gradually break of as small (3 to 7 μ) globules with concentric fibrillation. Soon these globules secrete a double contoured membrane, which is at first colorless, but after a few hours it becomes light brownish-yellow and highly refringent; now no internal structure can be recognized; the rest of the ameba becomes destroyed.

Staining gave the following results:

The nucleus furnishes chromidia to the protoplasm; these multiply and scatter throughout the plasm; the nucleus degenerates and dissolves or is ejected. The chromidia withdraw from the entoplasm, collect on the periphery, changing to thick, fibrillated strings, which collect in the ectoplasm, through which they extend as a uniform reticular chromidial mass. Ectoplasm lumps form, filled with the chromidial masses; these lumps become free globules, originally with the same structure. As soon as the membrane is formed, the nuclear stains do not enter well; but the same structure may be proved on section. When the yellow-brown membrane is completed, no inner structure can be recognized. Further development is not yet studied.

These small, 3 to 7 μ, spores are the infecting stage of amebic dysentery. Schaudinn fed some of them to a young cat, and on the evening of the third day he found bloody, slimy feces, with typical *E. histolytica;* death occurred on the afternoon of the fourth day, and postmortem examination showed typical, ulcerated, dysenteric colon. But a cat fed with the vegetative amebæ from this case did not take the disease; then it was fed with spores from the same man, and six days later it showed amebæ in the stools; it died two weeks later with typical amebic dysentery.

RESULTS OF STUDIES OF VARIOLA IN CLEVELAND, OHIO.

By Drs. W. T. HOWARD, Jr., R. G. PERKINS, W. H. WEIR, and
Mr. GEO. O. PAY, Cleveland, Ohio.

The extensive epidemic of smallpox which occurred in Cleveland in the years of 1901 and 1902, with a total of over 1,500 cases, gave an excellent opportunity for the study of the disease from various points of view. Through the efforts of the Chamber of Commerce and the Health Board, we obtained a fund making possible the establishment of a special research laboratory at the Detention Hospital, and two of us took up residence there for a period of three months. The work done at this time was almost entirely on fresh material, as it was thought that the study of the hardened material could well be deferred until the close of the epidemic.

Autopsies were made on forty cases, the series including all varieties of the disease, and the material from the vesicles and pustules was studied in the fresh and also in the hardened condition under a variety of circumstances. The work of previous observers was repeated as far as possible, and special endeavor was made with regard to the presence or absence of ameboid forms which could be differentiated from leucocytes. Parallel studies were made on smears from the blood both before and after death, the material being examined stained as well as fresh.

All this work gave entirely negative results, nothing being found in either blood or in exudate from vesicle or pustule which was suspected of being parasitic in nature. The bodies described by other observers as ameboid were for the most part found, but no ameboid motion was seen, and the bodies stained with specific fat stains such as osmic acid and Sudan III. The blood smears showed nothing abnormal. In the unbroken lesions up to and including the pustule there were no bacteria seen. This work was repeated in a large number of cases and the results were practically uniform. None of the bodies described by Reed in smallpox blood were seen. The conclusion was therefore arrived at that if there were parasites in the lesions and in the blood they were in a condition in which they could not be differentiated from the cell detritus.

Parallel with this series of observations cultures were made under special precautions to see whether there were any demonstrable bacteria in the lesions at any period, and these cultures were checked by coverslip examinations. A long series of these cultures, taken at all periods of the eruption, both before and after death, led to the conclusion that the lesions were independent of bacteria, not only in the vesicular stage but even in the pustular, provided there was no break of the surface. After death there was a rapid invasion of bacteria, especially of streptococci. These observations brought out nothing especially new but were confirmatory of the results of other observers and tended to the opinion that the cause of the lesion must be either a micro-organism of a type with which we were unfamiliar, or perhaps some sub-microscopic form. Experiments done in other laboratories at about the same time showed that the virus was non-filtrable, indicating that it was probably not sub-microscopic.

The frequent presence of the streptococcus led to side investigations as to the relations of this organism to the disease or its course. Certain observers, having noted its almost universal presence, have set it down as the real cause of smallpox, and some dispute still exists on the matter. Blood cultures were made at frequent intervals before death and in the course of the less severe cases, and were also made immediately after death in the fatal cases and again a few hours later. These cultures showed that the organism was present in the blood before death in practically all the severe cases, but not in the mild cases nor in the early pustular stage. It was also absent in the cases of fulminating hemorrhagic variola which came to our notice. If not present in the blood before death it was always found within a very short time afterwards, and in large numbers, usually even in pure culture. At the autopsy which was performed almost always within two hours after death, streptococci were found in all the organs in large numbers. They were found in especially large numbers in the lesions of the testicle, and their intimate relation with the areas of necrosis as demonstrated subsequently by sections was such as to indicate a possibility that they might be the cause of that lesion. Owing to the general distribution at that time after death this could not be stated with any certainty. In connection with this work a number of cases were treated with anti-streptococcus serum, the same which was already reported to have been very useful in scarlet fever, but entirely without result. The severe cases died in about the same time as the control untreated cases, and the less severe cases showed no tendency to a diminution of the secondary boils and abscesses which are such unpleasant sequelæ of the disease. In general the relation of the streptococci to smallpox appeared to be very similar to its relation to scarlet fever as demonstrated by Hektoen, namely, a secondary invader. That death may be at least in part due to a streptococcus bacteriemia seems more than probable, and it is unquestioned that the secondary abscesses are due to infections of late pustules. That the streptococcus bears no etiological relation whatever to the disease per se seems to be clearly demonstrated.

Experiments were made as to the changes of the amount of complement in the course of the disease. The method was not entirely satisfactory inasmuch as streptococci grow readily in normal blood serum, even undiluted, and indeed even in anti-streptococcus serum, so that the experiments had to be made with the typhoid and colon as more susceptible to changes in complement. The results showed that except in the cases which had numerous post-variolic abscesses and showed marked wasting, there was no special change, and the change in these latter cases seemed to be rather a result of the long continued infection than to have anything to do with liability to infection. This is in accord with the work of Longcope on the complement in wasting diseases. A series of inoculations into the anterior chambers of the eyes of rabbits, and another series of attempted intraperitoneal cultures in celloidin capsules, the material used being the exudate in the lesions, were entirely negative in results.

Another point taken up in the course of this work was the determination of the action of the blood serum in variola upon: I. Normal human erythrocytes and leucocytes from both vaccinated and unvaccinated individuals. II. Erythrocytes of individuals with variola. III. Leucocytes of pus in a non-variolous individual. IV. Erythrocytes of the rabbit. V. Erythrocytes of the ox. VI. Vascular and serous membrane endothelium of man and rabbit.

The conclusions reached in the course of this research were as follows:

I. The blood serum of variola obtained from both fatal and non-fatal cases, early and late in the disease, with and without streptococcus infection, causes agglutination of washed and unwashed erythrocytes of vaccinated, unvaccinated, and variolous human beings, and also those of the rabbit.

II. This agglutinating property is not affected by heating to 59° C. for one hour.

III. Variola serum has little if any hemolytic action on the erythrocytes of normal human beings. The washed erythrocytes of a variolous patient were dissolved by one of two variola sera tested.

IV. As variola serum is apparently inactive upon the washed and unwashed endothelial cells of the rabbit and of man, it is probable that the lysogenic effect exerted on the vascular endothelium is a local one.

On account of the complaints as to the quality of the vaccine virus on sale during the epidemic, a series of samples purchased in the open market were submitted to the laboratory, and careful cultures were taken, attention being given both to the number of colonies in each sample and the kind of organisms found in these colonies. Many of the samples, taken from the virus of the five best known manufacturers, showed streptococci either alone, or in connection with the pyogenic staphylococci. In all but one sample examined, actinomyces were seen, which on subsequent study were found to include six new varieties. The tetanus bacillus was not found in any case.

Microscopic study of the various organs revealed nothing of special importance tending to the solution of the problem, and has been temporarily abandoned.

At this stage in the work we were in receipt of a communication from Councilman, in which he gave us a brief abstract of the work he had done in regard to sections of the skin, and we at once turned to this phase of the problem. Sections of the skin at all stages of the lesion were cut by the paraffine method, and stained in a variety of ways, of which the Borrel method (magenta and picro-indiga carmine), the iron hematoxylon method, and the eosin methylene blue method with modifications which suggested themselves from time to time, proved to be the most efficient. The results of Councilman were confirmed, the bodies described by him being found under the circumstances described by him, in every case, and in the same relation to the course of the lesion as described by him and by Calkins. In addition to the stages noted by Councilman we were able to describe a further intracellular stage, intermediate between the first intracellular stage and the first intranuclear stage. In brief, a summary of the stages of the organism as seen by us is as follows:

1. Primary cytoplasmic stage found in the earliest lesions and in the auto-infection about vesicles. This stage begins with a small round homogenous deeply stained body, which develops into a large ameboid multi-chambered organism, which in turn breaks up with the discharge of gemmules, identical with the bodies primarily invading the epithelial cell.

2. Secondary cytoplasmic stage. The earliest forms recognized are from one and a half to two microns in diameter, surrounded by a definite spore or egg (?) membrance. These grow, develop chromatophile dots, fragment or segment, with the formation of oval cytoplasmic bodies with a central chromatin mass. From four to eight of these segmented bodies may be found in a single cell. These bodies escape from the cells in which they form and invade other cells and reach their nuclei,

where they further develop, being the earliest forms of the next stage.

Primary intranuclear stage. These ameboid bodies, representing the pansporoblast, first develop numerous dense dots staining deeply with the nuclear stains. These dots later become rings, the primary sporoblasts in which spores develop.

Secondary intranuclear stage. This stage begins with the invasion of fresh nuclei by the spores of the preceding stage, which form secondary sporoblasts developing numerous chambers each containing a spore.

Comparison of our results with those of Councilman, Calkins, and their associates shows —

First. That we have been able to confirm the primary cytoplasmic stage in toto.

Second. That we have as yet been unable to confirm Calkins' observations on the invasion of nuclei by gemmules with the resultant formation of male gametocytes.

Third. That we have been able to trace a large portion of a secondary cytoplasmic stage, beginning possibly with conjugation and ending with the formation of round or oval bodies, the product of a definite segmentation or fragmentation. These bodies invade nuclei, and are the earliest forms of the primary intranuclear stage of Calkins.

Fourth. That our work confirms the whole of the primary intranuclear stage of Calkins without modification.

Fifth. That we also confirm all the secondary intranuclear stage of Calkins. This is evidently the intranuclear stage of Councilman, Magrath and Brinckerhoff to whose original descriptions little has been added.

The study of the relation of the parasites to the skin lesions showed that the gemmules only were present in the papillary vessels and between these and the epidermis. Entering the epidermis the gemmules invade the deeper layers of the latter, make their way into the epithelial cells and lodge usually in the perinuclear space. Here by gradual growth and differentiation the primary cytoplasmic stage of the parasite's life cycle takes place. The completion of this corresponds with the development of the vesicles and the setting free of a new crop of gemmules, which as Councilman and his co-workers have shown is the same in both varioli and in vaccinia. In lesions somewhat further advanced the development of the secondary cytoplasmic stage is met with. At this time the lesion often contains a considerable number of leucocytes. With the completion of the secondary cytoplasmic stage the primary intranuclear stage begins, with the invasion of nuclei by the end forms of the secondary cytoplasmic stage. The end forms of the primary intranuclear and the earliest forms of the secondary stage may be seen in adjacent cells. The progress of the pock stops with the completion of the secondary intranuclear stage and the changes which follow are those of repair.

So intimate and so constant are the relations between the developmental stages of the parasite and the progress of the lesion that in a paper which is now in press we have proposed that these facts be utilized for diagnosis of doubtful cases of smallpox. With suitably prepared sections of excised skin diagnosis can be made in three days from the time of excision.

Our studies of human vaccinia now in progress have advanced far enough to enable us to state that the secondary intracellular and the two intranuclear stages do not occur in this disease. This confirms the work of Councilman and Tyzzer on animal vaccinia.

AN UNUSUAL CHANNEL OF INFECTION WITH THE *BACILLUS SHIGAE.*

By Prof. CHARLES WRIGHT DODGE, Rochester, N. Y.

During the past summer the bacteriological work at the Infants' Summer Hospital, at Charlotte, N. Y., has been largely confined to the study of the *Bacillus shigae* isolated from the stools of the patients. While working with the milk culture my assistant, Mr. S., accidentally broke the tube. A drop of the fluid spattered into his right eye causing a copious flow of tears which was still further aggravated by the disinfectant used to wash the face and eye, and some of the secretion was involuntarily swallowed. About twenty-four hours afterward typical clinical symptoms of acute dysentery appeared and lasted for several days, the patient suffering great prostration and loss of weight.

The evidence in such a case as this is necessarily circumstantial and infection may have taken place earlier as Mr. S. had been working with infants' stools for about three weeks previous to the attack, though he had of course used every precaution to avoid being infected. However, if the accident and the subsequent attack of dysentery are not mere coincidences the occurrence throws light on the rapidity with which infection with this bacillus is followed in man by the symptoms of the disease with which the bacillus is associated.

CONSTITUTION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

TITLE.

I. This Association shall be called "THE AMERICAN PUBLIC HEALTH ASSOCIATION."

OBJECTS.

II. The objects of the Association shall be the advancement of sanitary science, and the promotion of organizations and the measures for the practical application of public hygiene.

MEMBERS.

III. The members of the Association shall be known as Active, Associate, and Foreign.

The Executive Committee shall determine for which class a candidate shall be proposed. The Active members shall constitute the permanent body of the Association, subject to the provision of the Constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in, or devotion to, sanitary studies and allied science, and to the practical application of the same. The Associate members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote or hold office. Health officials, and other persons especially interested in matters relating to the public health of countries not included in the Association, may be elected as Foreign members. They shall have all the privileges and publications of the Association, but shall not be entitled to vote or hold office.

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy, and public health and marine hospital service, shall be entitled to be enrolled as Active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the committee, and on receiving a vote of two-thirds of the members present at the regular meeting, the candidate shall be declared duly elected a member of the Association. The annual fee of membership in each class shall be $5.00.

OFFICERS.

IV. The officers shall be a President, a First and Second Vice-President, a Secretary, and a Treasurer, and the officers of the various sections.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The President, or in his absence one of the Vice-Presidents, or in their absence a chairman pro tempore, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other committees, of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If, from the annual report of the Treasurer, there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association, until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary, Treasurer, and Chairmen of the various sections; (2) of six active members of whom three shall be elected annually by ballot to serve two years, and who shall be ineligible to reëlection for a second successive term; (3) of the ex-presidents of the Association; and (4) of the Chairman and Secretary of the Laboratory Section and the retiring chairman of that section.

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association, to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and briefly, the subjects to be presented and the special points of discussion.

ADVISORY COUNCIL.

X. The Advisory Council shall consist of one member from each state, territory, and district, the army, navy, and marine hspital service, the Dominion of Canada, and each of the provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall at their first meeting elect from their own number a secretary, whose record of their proceedings shall be made part of the records of the Association.

COMMITTEE ON PUBLICATION.

XI. The Committee on Publication shall consist of a Chairman, the Secretary of the Association, the Treasurer of the Association, and a member of each section of the Association, with the President of the Association, *ex-officio;* who shall contract for, arrange and publish, under authority of the Executive Committee, the proceedings of the Association, including such papers as have been examined and approved by the Executive Committee, or which have been submitted to them by the latter for their discretionary action.

REPORTS AND PAPERS.

XII. All committees preparing reports to be presented to the Association must submit the same to the Publication Committee not later than 30 days before the succeeding annual meeting of the Association; and all papers other than committee reports shall be in the hands of the Secretary not less than 20 days before.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called at any time or place, by concurrence of two-thirds of the Executive Committee. There shall be no election of officers, or change of by-laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four-fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the constitution of the Association, shall be made except at an annual meeting, or unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two-thirds of the members present.

SECTIONS.

XVII. Members of the Association may be authorized to form themselves into sections by vote of the Association at any annual meeting; such sections shall have power to nominate their officers to be elected by the Association, and to make by-laws which shall go into effect when approved by the Association.

BY-LAWS OF THE EXECUTIVE COMMITTEE.

QUORUM.

1. Five members shall constitute a quorum for the transaction of such business as may come before the committee.

MEMBERS RESTRICTED.

2. No elective member of the Executive Committee shall be at the same time a member of the Advisory Council, if there is another member of the Association from his state or service.

PARLIAMENTARY USAGE.

3. Cushing's Law and Practice of Legislative Assemblies shall be the guide in parliamentary practice until otherwise ordered.

PAPERS.

4. Papers to be presented at a general session of the Association shall be in the hands of the Secretary of the Association not less than twenty days before the coming meeting, and to be printed in the transactions in full or in abstract at the discretion of the Publication Committee.

5. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association, if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

6. Day papers shall be limited to twenty minutes, and evening papers to thirty minutes each.

DISCUSSION OF PAPERS.

7. After the leading papers on each subject, as indicated by the Executive Committee, have been read, discussion shall follow, and be confined strictly to the subject of these papers; and each speaker shall be limited to ten minutes, and shall not speak a second time until

after every other member who desires to be heard, and then only for five minutes, except by unanimous consent.

8. The Chair shall notify gentlemen who desire to speak to send their names, and they shall be called on in the order sent up; and he may, at his discretion, limit the time of speaking to five instead of ten minutes, if in his judgment it may become necessary to do so in order to allow each one on the list an opportunity to be heard.

PUBLICATION COMMITTEE.

9. The Publication Committee shall consist of a Chairman, the Secretary of the Association, the Treasurer of the Association, and a member of each section of the Association, with the President of the Association *ex-officio*.

10. Unless otherwise ordered by the Association, such committee is hereby instructed to keep the size of the annual transactions within the limits of four hundred pages; and to this end to conform to the several following rules:

a. Make summaries of such local and other addresses as are not of permanent scientific value.

b. The Chairman of the several Standing Committees shall be notified by the Secretary that the reports to be presented by them shall include any material prepared by the several members of their committees and must be in the hands of the Publication Committee not later than thirty days before the succeeding annual meeting for preliminary printing.

c. Such reports shall be printed for distribution to the members on registering at the coming meeting; but no report shall be printed unless in the hands of the Publication Committee, as specified above.

11. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

12. All applications for membership must be made upon the application blank of the Association.

13. Persons not members, having prepared papers to be presented at the meetings of the Association, shall be proposed for membership at the first business meeting of the Association.

EXPENDITURES.

14. All bills connected with the publication of the transactions shall, upon the approval of the chairman of the Publication Committee and

the Secretary, be signed by the president of the Association, and paid by check of the Treasurer directly to the party concerned; and the President shall not approve any bill, relating either to publishing or printing, without the approval first of the chairman of the committee in charge thereof.

15. Bills for current expenses shall be first approved by the Secretary, then sent to the President, and on his approval they shall be paid by check of the Treasurer directly to the parties interested.

16. The actual and necessary traveling expenses of the Secretary and Treasurer to the annual meeting of the Association, and to one meeting of the Executive Committee, shall be classed as current expenses.

RESOLUTIONS.

17. All resolutions presented to the Association shall be sent to the Chair in writing, and referred to a committee without discussion.

ARREARAGES.

18. The arrearages of all members remitting their dues for two years shall be cancelled up to the date of the last payment, but they shall be entitled to the transactions of the Association only for the years for which they have actually paid.

AUDITING COMMITTEE.

19. An Auditing Committee shall be appointed by the Chair to audit the accounts of the Treasurer, and report upon the same.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

OFFICERS 1905.

President	Dr. F. F. Wesbrook, Minneapolis, Minnesota.
First Vice President	Dr. Juan Guiteras, Havana, Cuba.
Second Vice President	Dr. Fernando Lopez, Mexico, Mexico.
Third Vice President	Dr. John A. Macdonald, Brandon, Manitoba.
Secretary	Dr. Charles O. Probst, Columbus, Ohio.
Treasurer	Dr. Frank W. Wright, New Haven, Connecticut.

PRESIDENTS OF THE ASSOCIATION.

Stephen Smith, M. D.	1872, '73, '74
*Joseph M. Toner, M. D.	1875
*Edwin M. Snow, M. D.	1876
*John H. Rauch, M. D.	1877
*Elisha Harris, M. D.	1878
*James L. Cabell, M. D.	1879
John S. Billings, M. D.	1880
*Charles B. White, M. D.	1881
*Robert C. Kedzie, M. D.	1882
*Ezra M. Hunt, M. D.	1883
*Albert L. Gihon, M. D.	1884
*James E. Reeves, M. D.	1885
Henry P. Walcott, M. D.	1886
George M. Sternberg, M. D.	1887
Charles N. Hewitt, M. D.	1888
*Hosmer A. Johnson, M. D.	1889
Henry B. Baker, M. D.	1890
Frederick Montizambert, M. D.	1891
Felix Formento, M. D.	1892
Samuel H. Durgin, M. D.	1893
Emmanuel P. Lachapelle, M. D.	1894
William Bailey, M. D.	1895
Eduardo Liceaga, M. D.	1896
*Henry B. Horlbeck, M. D.	1897
Charles A. Lindsley, M. D.	1898
*George H. Rohe, M. D.	1899
Henry Mitchell, M. D.	1899
Peter H. Bryce, M. D.	1900
Benjamin Lee, M. D.	1901
Henry D. Holton, M. D.	1902
Walter Wyman, M. D.	1903
Carlos J. Finlay, M. D.	1904

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* Deceased.

STANDING COMMITTEES.

EXECUTIVE COMMITTEE.

[The Officers and Ex-Presidents of the Association and the Chairman, Secretary and retiring Chairman of the Laboratory Section are ex-officio members of the Executive Committee.]

ELECTIVE MEMBERS.

Dr. A. H. Doty	Quarantine, S. I., N. Y.
Dr. John Lainy Leal	Paterson, N. J.
Prof. F. C. Robinson	Brunswick, Me.
Dr. Marcus Haase	Memphis, Tenn.
Dr. Charles V. Chapin	Providence, R. I.
Dr. Wm. C. Chapman	Toledo, Ohio.

PUBLICATION COMMITTEE.

Dr. Josiah Hartzell	Canton, Ohio.
Dr. C. O. Probst	Columbus, Ohio.
Dr. Frank W. Wright	New Haven, Conn.
Dr. Herbert D. Pease	Albany, N. Y.

The President ex-officio Member.

ADVISORY COUNCIL.

United States:

Alabama	
Alaska	
Arkansas	
Arizona	
California	Dr. A. J. Rice, *San Francisco.*
Colorado	
Connecticut	T. H. McKenzie, *Southington.*
Delaware	W. C. R. Colquhoun, *Wilmington.*
Florida	Dr. J. Y. Porter, *Jacksonville.*
Georgia	
Hawaii	
Idaho	
Illinois	Dr. Liston H. Montgomery, *Chicago.*
Indiana	Dr. J. N. Hurty, *Indianapolis.*
Iowa	Dr. A. M. Linn, *Des Moines.*
Kansas	
Kentucky	Dr. J. N. McCormack, *Bowling Green.*
Louisiana	Dr. Quitman Kohnke, *New Orleans.*
Maine	Prof. F. C. Robinson, *Brunswick.*

Maryland	Dr. John S. Fulton, *Baltimore.*
Massachusetts	Dr. S. H. Durgin, *Boston.*
Michigan	Henry A. Haigh, Esq., *Detroit.*
Minnesota	Dr. Henry Hutchinson, *St. Paul.*
Mississippi	Dr. H. McM. Folkes, *Biloxi.*
Missouri	Dr. H. Wheeler Bond, *St. Louis.*
Montana	
Nebraska	
Nevada	
New Hampshire	Dr. G. P. Conn, *Concord.*
New Jersey	Dr. R. N. Connelly, *Newark.*
New Mexico	
New York	Dr. Walter D. Greene, *Buffalo.*
North Carolina	Dr. R. H. Lewis, *Raleigh.*
North Dakota	Dr. H. D. Quarry, *Grand Forks.*
Ohio	Dr. W. C. Chapman, *Toledo.*
Oklahoma Territory	
Oregon	
Pennsylvania	Dr. Benjamin Lee, *Philadelphia.*
Philippine Islands	
Porto Rico	Dr. Wm. F. Smith, *San Juan.*
Rhode Island	Dr. C. V. Chapin, *Providence.*
South Carolina	Dr. Chas. M. Rees, *Charleston.*
South Dakota	
Tennessee	Dr. Marcus Haase, *Memphis.*
Texas	Dr. J. H. Smart, *Dallas.*
Utah	Dr. T. B. Beatty, *Salt Lake City.*
Vermont	Dr. C. S. Caverly, *Rutland.*
Virginia	
Washington	Dr. James B. Eagleson, *Seattle.*
West Virginia	Dr. James H. Brownfield, *Fairmont.*
Wisconsin	H. L. Russell, *Madison.*
District of Columbia	Dr. Wm. C. Woodward, *Washington.*
U. S. Army	Dr. B. K. Ashford, *Porto Rico.*
U. S. Navy	Dr. Henry G. Beyer, *Washington, D. C.*
U. S. P. H. and M. H. Service	Dr. C. P. Wertenbaker, *Washington, D. C.*

Canada:

Dominion of Canada	Dr. Frederick Montizambert, *Ottawa.*
British Columbia	Dr. J. C. Fagan, *Victoria.*
Ontario	Dr. J. A. Amyot, *Toronto.*
Quebec	Dr. E. P. Lachapelle, *Montreal.*
Manitoba	Dr. John A. Macdonald, *Brandon.*
New Brunswick	Dr. E. Bayard Fisher, *Fredericton.*
Nova Scotia	

Cuba:

Republic of Cuba	Dr. Juan Guiteras, *Havana.*

Mexico:

Aguas Calientes ....Dr. A. Pruneda, *Mexico, D. F.*
Campeche ....Dr. Domingo Orvananos, *Mexico, D. F.*
Colima ....Dr. Luis E. Ruiz, *Mexico, D. F.*
Coahulia ....Dr. David Cerna, *Saltillo.*
Chihuahua ....Dr. Daniel Munoz, *Chihuahua.*
Chiapas ....
Durango ....Dr. Jose L. Gomez, *Mexico, D. F.*
Guanajuato ....Dr. Jesus Chico, *Guanajuato City.*
Guerrero ....
Hidalgo ....Dr. Ramon Prado, *Mexico, D. F.*
Jalisco ....Dr. Adolfo Oliva, *Mexico, D. F.*
Michoacan ....Dr. Francisco Bernaldez, *Mexico, D. F.*
Morelos ....Dr. Fernando Lopez, *Mexico, D. F.*
Mexico ....Dr. Ignacio Guzman, *Toluca.*
Nuevo Leon ....Dr. Pedro Noriega, *Monterey.*
Oaxaca ....Dr. Alberto Carriedo, *Oaxaca.*
Puebla ....Dr. J. Joaquin Urrutia, *Puebla.*
Queretaro ....Dr. Augustin Ruiz Ollogui, *San Juan del Rio Qro.*
San Luis Potosi.........Dr. Jesus E. Monjaras, *San Luis Potosi.*
Sonora ....Dr. Angel Gavino, *Mexico, D. F.*
Sinaloa ....Dr. Narcisco del Rio, *Veracruz.*
Tobasco ....Dr. Gonzales Fabela, *Mexico, D. F.*
Tamaulipas ....Dr. Antonio Matienzo, *Tampico.*
Tlaxcala ....Dr. Jose Gayon, *Mexico, D. F.*
Veracruz ....Dr. Manuel Iglesias, *Veracruz.*
Yucatan ....Dr. Augustin Chacon, *Mexico, D. F.*
Zacatecas ....Dr. Juan Brena, *Zacetecas.*
Territorio de la Baja California ....
Territorio de Tepic....
Distrito Federal........Dr. Eduardo Liceaga, *Mexico, D. F.*

LABORATORY SECTION.

OFFICERS.

Dr. W. H. Park, New York, N. Y.	Chairman.
Dr. W. H. Clark, Boston, Mass.	Vice-Chairman.
Dr. John S. Fulton, Baltimore, Md.	Secretary.
Dr. H. D. Pease, Albany, N. Y.	Recorder.

MEMBERS OF THE COUNCIL.

Dr. V. A. Moore	Ithaca, N. Y.
Prof. F. C. Robinson	Brunswick, Me.
Dr. E. G. Horton	Columbus, Ohio.
Dr. Aristides Agramonte	Havana, Cuba.

REVISED LIST OF MEMBERS

AMERICAN PUBLIC HEALTH ASSOCIATION

1904.

This list includes those who have maintained their membership to the present time, counting those joining in 1904. The Secretary should be notified of any errors or omissions.

MEMBERS.

Adams, J. F. A., M. D.	Pittsfield, Mass.	1881
Adams, J. P.	713 Macheca Bldg., New Orleans, La.	1902
Adgate, Grace	515 Lexington Ave., New York, N. Y.	1901
Agnew, Frank E., M. D.	Paterson, N. J.	1902
Alexander, Edward, M. D.	El Paso, Texas.	1892
Allen, Thomas G., M. D.	439 Elk St., Buffalo, N. Y.	1902
Alvord, J. W., C. E.	127 Hartford Building, Chicago, Ill.	1899
Amherst College Library	Amherst, Mass.	1901
*Amyot, Jno. A., M. D.	30 St. Joseph St., Toronto, Ont.	1900
*Anderson, John F., M. D., U. S. P. H. and M. H. S.	Washington, D. C.	1903
*Archinard, John J., M. D.	830 Canal St., New Orleans, La.	1902
Archinard, Paul Emile, M. D.	830 Canal St., New Orleans, La.	1902
Arment, Samuel B., M. D.	Bloomsburg, Pa.	1901

*Badger, Ernest F.	48 Weybosset St., Providence, R. I.	1900
Baggs, A. N., M. D.	Abington, Pa.	1901
Bailey, William, M. D.	215 Broadway, Louisville, Ky.	1879
Bailhache, P. H., M. D., P. H. and M. H. S.	Stapleton, N. Y.	1874
Ball, Charles B., C. E.	118 Hazel Ave., Chicago, Ill.	1903
Barbour, Frank A., C. E.	1121 Tremont Bldg., Boston, Mass.	1900
Barnes, Henry Jabez, M. D.	429 Beacon St., Boston, Mass.	1896
Barrow, A. Feltus, M. D.	St. Francisville, La.	1902
Bartlett, James W.	Dover, N. H.	1888
Bashore, Harvey B., M. D.	West Fairview, Pa.	1897
Battle, Samuel W., M. D.	Asheville, N. C.	1887
Beckwith, D. H., M. D.	94 Dorchester Ave., Cleveland, Ohio.	1884
Beebe, Henry E., M. D.	Sidney, Ohio.	1882
Bell, A. N., M. D.	337 Clinton St., Brooklyn, N. Y.	1872
*Bell, Gordon, M. D.	Winnipeg, Manitoba.	1899
Bennett, Francis M., M. D.	137½ State St., Springfield, Mass.	1901
Bernaldez, Francisco, M. D.	Estampa-Merced 5, Mexico, Mex.	1892
Beshoar, Benjamin B., M. D.	Trinidad, Col.	1903
Beshoar, Michael, M. D.	Trinidad, Col.	1895
*Bevier, Prof. Isabel	University of Illinois, Urbana, Ill.	1900

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* Also members of Section of Bacteriology and Chemistry.

*Beyer, Prof. George E.............Tulane University, New Orleans, La. 1902
*Bissell, Wm. G., M. D.... ....148 Elmwood Ave., Buffalo, N. Y. 1900
Bland, John J., M. D............1043 Carondelet St., New Orleans, La. 1902
Boardman, Wm. Frears.........Department of Interior, Ottawa, Ont. 1898
Board of Health....................................Manchester, N. H. 1899
*Boling, Geo. E......................1257 Belmont St., Brockton, Mass. 1900
Bond, H. Wheeler, M. D... .....17 Vanderwenter St., St. Louis, Mo. 1903
Bracken, H. M., M. D......514 Pioneer Press Bldg., St. Paul, Minn. 1895
Brackett, C. F., M. D...............................Princeton, N. J. 1899
Braunnagel, Julius, M. D... ....Box 925, San Antonio, Tex. 1890
Brena, Juan, M. D...... ....Zacatecas, Mex. 1898
Brewer, Prof. William H., M. D..................New Haven, Conn. 1874
Brown, George, M. D......................................Atlanta, Ga. 1902
Brownfield, James H., M. D...........321 Main St., Fairmont, W. Va. 1902
Brush, Edward F., M. D...........................Mt. Vernon, N. Y. 1903
Bryce, Peter H., M. D...........Department of Interior, Ottawa, Ont. 1883
Burroughs, Jas. A., M. D...........................Asheville, N. C. 1898
Butterfield, F. C............ ....Derby Line, Vt. 1902
*Buxton, Bertram H., M. D........1 West 101st St., New York, N. Y. 1901
*Caird, James M.............................271 River St., Troy, N. Y. 1900
Cameron, J. Chalmers, M. D........941 Dorchester St., Montreal, P. Q. 1894
Campbell, Alexander McKenzie, M. D.........Grand Rapids, Mich. 1903
Campbell, Edw. R., M. D.,...........................Bellows Falls, Vt. 1902
Cantrell, Geo. M. D., M. D.......116 Louisiana St., Little Rock, Ark. 1902
*Carey, Harry Wardell, M. D..........22 Lancaster St., Albany, N. Y. 1902
Carnegie Library ....Pittsburg, Pa. 1902
*Carroll, James, M. D..........................Washington, D .C. 1903
Carter, Henry R., M. D...................................Ancon, Panama. 1902
Caverly, Charles S., M. D..................................Rutland, Vt. 1894
Chacon, Augustin, M. D..............Cocheras No. 21, Mexico, Mex. 1902
Chaille, Prof. Stanford E........P. O. Drawer 261, New Orleans, La. 1874
Chalaron, Frank J., M. D........1318 Esplanade St., New Orleans, La. 1902
*Chamot, E. M.......................Cornell University, Ithaca, N. Y. 1903
Chandler, Prof. C. F...............Columbia College, New York, N. Y. 1872
Chandler, David D.....................74 North 7th St., Newark, N. J. 1896
Chapin, Charles V., M. D...........................Providence, R. I. 1886
Chapman, W. C., M. D.................1710 Madison St., Toledo, Ohio. 1900
Chase, Herman L., M. D..............................Brookline, Mass. 1895
Chase, John C., C. E.......................................Derry, N. H. 1890
Chausse, Alcide ....1539 Notre Dame St., Montreal, P. Q. 1901
Chico, Jesus, M. D....2 Estrella St., Guanajuato City, Guanajuato, Mex. 1891
Church, Thomas Teasdale, M. D........70 E. Main St., Salem, Ohio. 1890
*Clark, Harry W........................State House, Boston, Mass. 1896
Clark, J. Fred, M. D.......................................Fairfield, Ia. 1899
Conn, G. P., M. D.......................................Concord, N. H. 1875
*Connell, Walter Thomas, M. D......................Kingston, Ont. 1898
*Connelly, R. N., M. D......................................Newark, N. J. 1898
Conner, P. S., M. D.................215 West Ninth St., Cincinnati, O. 1884
Cook, J. T., M. D..................636 Delaware Ave., Buffalo, N. Y. 1901

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* Also members of Section of Bacteriology and Chemistry.

*Coplin, William L.	1629 South Broad St., Philadelphia, Pa.	1897
Corbett, J. F., M. D.	2446 Park Ave., Minneapolis, Minn.	1899
*Coster, W. H.	Sixth Ave. and Cherry Alley, Pittsburg, Pa.	1901
Cowing, Hugh A., M. D.	210 High St., Muncie, Ind.	1900
Cox, Edgar, M. D.	13½ West Mulberry St., Kokomo, Ind.	1900
Craig, G. G., M. D.	Rock Island, Ill.	1880
Crandall, Wm. S.	309 Broadway, New York, N. Y.	1901
Crane, William Henry, M. D.	20 West Ninth St., Cincinnati, O.	1903
Craven, McDonough, C. E.	263 82d St., Brooklyn, N. Y.	1899
Croes, J. James R., C. E.	68 Broad St., New York, N. Y.	1877
Crossland, Jefferson C., M. D.	213 Seventh St., Zanesville, O.	1902
Curtis, Francis George, M. D.	West Newton, Mass.	1897
Curtis, F. C., M. D.	17 Washington Ave., Albany, N. Y.	1883
Davis, Clark W., M. D.	902 Elm St., Cincinnati, Ohio.	1903
*Davis, Floyd, Ph. D.	Des Moines, Ia.	1890
Dalrymple, Wm. H., V. S.	Baton Rouge, La.	1902
*Denny, F. P., M. D.	Brookline, Mass.	1901
Dennis, Laban, M. D.	30 Central St., Newark, N. J.	1877
Disbrow, Wm. S., M. D.	151 Orchard St., Newark, N. J.	1899
*Dodge, Charles Wright	University of Rochester, Rochester, N. Y.	1901
Dodge, William E., Jr.	11 Cliff St., New York, N. Y.	1874
*Donaldson, Wellington	Knoxville, Tenn.	1903
*Dorset, Marion, M. D.	Bureau Animal Industry, Washington, D. C.	1900
Doty, Alvah H., M. D.	Rosebank, N. Y.	1896
Douglas, Alexander Joseph, M. D.	Winnipeg, Manitoba.	1903
Dubose, W. R., M. D.	U. S. Navy, Washington, D. C.	1903
Dudley, Charles P., M. D.	Altoona, Pa.	1888
Durgin, Samuel H., M. D.	12 Beacon St., Boston, Mass.	1875
Dyer, Isadore, M. D.	124 Baronne St., New Orleans, La.	1902
Eagleson, James B., M. D.	512 Burke Building, Seattle, Wash.	1896
Earl, George Goodell	602 Carondelet St., New Orleans, La.	1902
Eaton, J. M., M. D.	Carberry, Manitoba.	1901
Egan, J. A., M. D.	Springfield, Ill.	1897
Egbert, Seneca, M. D.	17th and Cherry Sts., Philadelphia, Pa.	1901
*Elgin, W. F., M. D.	Glenolden, Pa.	1900
Eliot, Llewellyn, M. D.	1106 P. St. N. W., Washington, D. C.	1902
*Ellms, J. W.	East Court and Martin Sts., Cincinnati, Ohio.	1897
Elsner, John, M. D.	P. O. Box 454, Denver, Col.	1887
Embich, Milton A.	Boiling Springs, Pa.	1903
*Emerson, H. C., M. D.	11 Maple St., Springfield, Mass.	1899
*Ernst, Harold C., M. D.	Harvard Medical School, Boston, Mass.	1899
Evans, Joseph S., Jr., M. D.	Univ.. of Pa., Philadelphia, Pa.	1903
Exton, James A., M. D.	75 Beech St., Arlington, N. J.	1897
*Fabelo, Octavino Gonzales, M. D.,	10 Calle de la Violetta, No. 6, Mexico, Mex.	1901
Fagan, C. J., M. D.	Victoria, B. C.	1901

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* Also members of Section of Bacteriology and Chemistry.

Fales, Frank L., C. E. ....City Hall, Cincinnati, Ohio. 1893
Farnham, Edwin, M. D. ....Cambridge, Mass. 1889
Farquhar, A. B., Esq. ....York, Pa. 1880
Fenton, Thomas, H., M. D., Spruce and Juniper Sts., Philadelphia, Pa. 1897
Ferguson, F., M. D. ....20 W. 38th St., New York, N. Y. 1892
Finlay, Carlos Juan, M. D. ....128 Reina, Havana, Cuba. 1902
Fisher, E. B., M. D. ....Fredericton, N. B. 1901
Fisher, Prof. Irving ....New Haven, Conn. 1903
Forwood, William H., M. D....1425 Euclid Place, Washington, D. C. 1903
Francis, Charles, C. E. ....8 Masonic Temple, Davenport, Ia. 1903
Flick, Lawrence F., M. D. ....732 Pine St., Philadelphia, Pa. 1890
Fogarty, Joseph Norman, M. D. ....227 Duval St., Key West, Fla. 1902
Folkes, Hyman McMackin, M. D. ....Howard Ave., Biloxi, Miss. 1902
*Foote, Charles Jenkins, M. D. ....26 Elm St., New Haven, Conn. 1895
Force, Jno. P., C. E. ....Columbus, Ohio. 1900
Formento, Felix, M. D. ....735 Esplanade Ave., New Orleans, La. 1880
*Freeman, R. G., M. D. ....478 W. 59th St., New York, N. Y. 1899
Fries, Albert, M. D. ....92 Reade St., New York, N. Y. 1897
*Fuller, George W. ....170 Broadway, New York, N. Y. 1892
*Fulton, John S., M. D. ....10 South St., Baltimore, Md. 1897
Furniss, Henry W., M. D. ....Bahia, Brazil. 1900

Gable, Isaac C., M. D. ....26 South St., York, Pa. 1897
*Gage, Stephen DeM. ....Experiment Station, Lawrence, Mass. 1901
Gayon, Jose P., M. D. ....Mexico City, Mex. 1902
*Gehrmann, Adolph, M. D. ....3816 Ellis St., Chicago, Ill. 1895
Gemmill, W. T., M. D. ....Forest, Ohio. 1900
Gerhard, Wm. Paul, C. E....33 Union Square West, New York, N .Y. 1880
Gerrish, Frederic H., M. D. ....Portland, Me. 1885
*Gilliland, S. H., M. D. ....3608 Pine St., Philadelphia, Pa. 1900
Goldwater, S. S., M. D. ....Mt. Sinai Hospital, New York, N. Y. 1902
Goler, Geo. W., M. D. ....127 East Ave., Rochester, N. Y. 1900
Goodridge, E. A., M. D. ....63 Jamaica Ave., Flushing, N. Y. 1900
Gorgas, Wm. C., M. D., U. S. A. ....Ancon, Panama. 1901
*Gorham, Fred. P. ....Brown University, Providence, R. I. 1899
Graves, E. E., M. D. ....Penacook, N. H. 1886
Gray, Samuel M., C. E. ....10 Weybosset St., Providence, R. I. 1891
Green, J. Mercier, M. D. ....Charleston, S. C. 1902
Greene, Walter D., M. D. ....385 Jersey St., Buffalo, N. Y. 1902
Greenleaf, Chas. R., M. D., U. S. A. ....San Francisco, Cal. 1901
Grubbs, Samuel Bates, M. D. ....Gulf Quar. Sta., Biloxi, Miss. 1902
Guiteras, Juan, M. D. ....119 San Miguel St., Havana, Cuba. 1902
Guthrie, John B., M. D. ....124 Baronne St., New Orleans, La. 1902

Haase, Marcus, M. D. ....Memphis, Tenn. 1902
Hagey, Jacob Moyer, M. D. ....Mt. Morris, N. Y. 1892
Haigh, Henry A., Esq. ....47 Alexandrine Ave., Detroit, Mich. 1901
*Harrington, Charles, M. D. ....State House, Boston, Mass. 1901
*Harris, Norman, McL., M. D. ....University of Chicago, Chicago, Ill. 1899

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* Also members of Section of Bacteriology and Chemistry.

Harrison, F. C. S., M. D.	Guelph, Ont.	1901
Harrison, George Wood, M. D.	404 Second St., Ashland, Wis.	1896
Hartzell, Josiah, Ph. D.	Canton, Ohio.	1895
Harvard College Library	Cambridge, Mass.	1900
Haskell, W. A., M. D.	Alton, Ill.	1883
Hawkins, R. G., M. D.	Palmetto, La.	1902
*Hazen, Allen, C. E.	220 Broadway, New York, N. Y.	1892
Hengerer, William	Buffalo, N. Y.	1896
Hershey, Milton H.	Montreal, Que.	1903
Hering, Rudolph, C. E.	170 Broadway, New York, N. Y.	1878
Herold, H. C. H., M. D.	Newark, N. J.	1898
Hill, G. Everett, C. E.	156 Fifth Ave., New York, N. Y.	1897
*Hill, Hibbert W., M. D.	739 Boylston St., Boston, Mass.	1896
Hill., John Edw	Brown Univ., Providence, R. I.	1902
Hill, John W., C. E.	City Hall, Philadelphia, Pa.	1896
*Hiss, Philip H., Jr., M. D.	437 W. 59th St., New York, N. Y.	1899
*Hodenpyl, Eugene, M. D.	437 W. 59th St., New York, N. Y.	1901
Hohenschuh, W. P.	Iowa City, Ia.	1899
*Hollis, Frederick S.	29 Norton St., New Haven, Conn.	1902
Holmes, A. Mansfield, M. D.	205 Jackson Block, Denver, Colo.	1899
Holton, Henry D., M. D.	Brattleboro, Vt.	1875
*Horton, Elmer G., B. S.	Columbus, Ohio.	1897
*Huddleston, J. H., M. D.	126 W. 85th St., New York, N. Y.	1899
Hunt, C. C., M. D.	Dixon, Ill.	1889
Hurtado, Francisco, M. D.	1636 a Presidente St., Mexico City, Mex.	1902
Hurty, John N., M. D.	29 E. Second St., Indianapolis, Ind.	1896

Iglesias, Manuel S., M. D.	Veracruz, Mex.	1900
Irons, Ernest E.	University of Chicago, Chicago, Ill.	1900

*Jackson, Daniel D.,	Flatbush Ave. and Eastern Parkway, Brooklyn, N. Y.	1899
Johnson, Chas. B., M. D.	Champaign, Ill.	1897
*Johnson, Geo. A.	Columbus, Ohio.	1900
Johnson, H. L. E., M. D.	1821 Jefferson Place, Washington, D. C.	1903
Jones, Hamilton Polk, M. D.	124 Baronne St., New Orleans, La.	1902
Jones, Heber, M. D.	Memphis, Tenn.	1902
Jones, Leander P., M. D.	Greenwich, Conn.	1889
*Jordan, Edwin O.	University of Chicago, Chicago, Ill.	1899
Jordan, Thomas, M. D.	Board of Health, Boston, Mass.	1902
Justice, Wm. W.	Germantown, Philadelphia, Pa.	1901

Karsner, Charles W., M. D.	1320 S. Broad St., Philadelphia, Pa.	1897
Kellogg, J. H., M. D.	Battle Creek, Mich.	1878
*Kendall, Arthur I.	1020 N. Broadway, Baltimore, Md.	1902
Kennedy, J. F., M. D.	Des Moines, Iowa.	1885
Kiefer, Guy Lincoln, M. D.	365 St. Aubin Ave., Detroit, Mich.	1902
King, William A.	Census Bureau, Washington, D. C.	1901
*Kinnicutt, Leonard P., S. D.	Worcester, Mass.	1899

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* Also members of Section of Bacteriology and Chemistry.

*Kinyoun, J. J., M. D..................................Glenolden, Pa. 1902
Kinney, Alfred, M. D..................................Astoria, Ore. 1903
*Kneass, S. S., M. D..................1510 Walnut St., Philadelphia, Pa. 1899
*Knowles, Morris, C. E.............Bureau of Filtration, Pittsburg, Pa. 1901
Knox, S. P. B., M. D..................912 Anacapa, Santa Barbara, Cal. 1892
Knox, William F., M. D............................McKeesport, Pa. 1887
Kober, George M., M. D................1600 T St., Washington, D. C. 1896
Kohn, Joseph........................500 Canal St., New Orleans, La. 1902
Kohnke, Quitman, M. D.......1315 St. Andrew St., New Orleans, La. 1902
Koon, Thomas M., M. D........................Grand Rapids, Mich. 1903
Kuichling, Emil, C. E.................52 Broadway, New York, N. Y. 1882

Lachapelle, E. Persillier, M. D.....................Montreal, P. Q. 1887
Leal, Frances de P., M. D...........6 2d. San Lorenzo, Mexico, Mex. 1903
Leal, John Lainy, M. D.............149 Ellison St., Paterson, N. J. 1891
Learned, John B., M. D.........................Northampton, Mass. 1889
Lee, Benjamin, M. D.............1420 Chestnut St., Philadelphia, Pa. 1874
*Leighton, Marshall O................U. S. G. S., Washington, D. C. 1897
Leiter, L. Z., Esq........................P O. Drawer L., Chicago, Ill. 1876
Levy, M., M. D.....................Macheca Bldg., New Orleans, La. 1902
Lewis, Daniel, M. D.............249 Madison Ave., New York, N. Y. 1894
Lewis, E. S., M. D..................124 Baronne St., New Orleans, La. 1902
Lewis, Richard H., M. D.................................Raleigh, N. C. 1892
Liceaga, Eduardo, M. D..............4 San Andres St., Mexico, Mex. 1891
Lindsley, Charles A., M. D.......................New Haven, Conn. 1875
Lindsley, J. M., M. D...........272 Manhattan Ave., New York, N. Y. 1902
Linn, Alex. M., M. D..............218 Sixth Ave., Des Moines, Iowa. 1902
Loeber, F., M. D.................1629 Coliseum St, New Orleans, La. 1902
Lopez, Fernando, M. D............................Mexico City, Mex. 1901
Ludlow, Jacob Lott, C. E....................Winston-Salem, N. C. 1903
Lumsden, W. J., M. D.........................Elizabeth City, N. C. 1892
*Lyons, Robert E................630 East Third St., Bloomington, Ind. 1900

McClelland, J. H., M. D........Fifth and Wilkins Ave., Pittsburg, Pa. 1885
McClung, Hester.....................312 N. West St., Indianapolis, Ind. 1900
McCormack, J. N., M. D.........................Bowling Green, Ky. 1880
McCutcheon, Percival B., M. D..203 Carondolet St., New Orleans, La. 1902
Macdonald, Jno. A., M. D.....................Brandon, Manitoba. 1900
*McFarland, Joseph, M. D...........447 Stafford St., Germantown, Pa. 1897
McGehee, E. L, M. D.............Macheca Bldg., New Orleans, La. 1902
McKlveen, John A., M. D..........................Chariton, Iowa. 1899
McLaughlin, Geo. E., M. D........41 Crescent Ave., Jersey City, N. J. 1901
Magennis, Bryan C., M. D................Bridge St., Paterson, N. J. 1900
Maignen, P. A.......................1310 Arch St., Philadelphia, Pa. 1902
Marchand, Charles..................57 Prince St., New York, N. Y. 1900
Marquez, Miguel, M. D............Oficiana Calle 49, Chihuahua, Mex. 1896
Marsh, E. J., M. D.....................600 Park Ave., Paterson, N. J. 1872
Marshall, Charles E....................Agricultural College, Mich. 1901
Massachusetts Institute Technology................Boston, Mass. 1901

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* Also members of Section of Bacteriology and Chemistry.

Matthews, W. E., M. D.	425 Lincoln St., Johnstown, Pa.	1897
May, George S.	74 Rideau St., Ottawa, Ont.	1902
Mayer, Fred. J., M. D.	Scott, La.	1902
Mead, Daniel Webster, C. E.	1st National Bank Bldg., Chicago, Ill.	1892
Mead, Julian Augustus, M. D.	Irving St., Watertown, Mass.	1896
Meehan, J. H., M. D.	432 Third St., Niagara Falls, N. Y.	1901
*Metz, Abraham L., M.D.	Medical Dept. Tulane Univ., New Orleans, La.	1902
Miller, Wm. T., M. D.	260 Euclid Ave., Cleveland, Ohio.	1902
Mitchell, Henry, M. D.	Asbury Park, N. J.	1886
Moat, Charles P.	Burlington, Vt.	1903
Mohr, Charles, M. D.	Oak Lane, Philadelphia, Pa.	1897
*Monjaras, Jesus E., M. D.	2 a de Yturbide No. 1, Mexico, D. F.	1891
Monjeau, C., C. E.	Middletown, Ohio.	1887
Montgomery, L. H., M. D.	92 State St., Chicago, Ill.	1879
Montizambert, Frederick, M. D.	Ottawa, Ont.	1885
*Moore, Veranus A., M. D.	Veterinary College, Ithaca, N. Y.	1896
Morgan, David Percy	Box 2036, New York, N. Y.	1885
Morse, W. F., S. E.	18 Broadway, New York, N. Y.	1889
Mosher, Eliza M., M. D.	44 Court St., Brooklyn, N. Y.	1889
Mulford, Henry K.	412 So. 13th St., Philadelphia, Pa.	1896

Nagle, John T., M. D.	163 West 126th St., New York, N. Y.	1874
Neff, J. L., M. D.	Mutual Life Bldg, Philadelphia, Pa.	1897
Newbury Library	Chicago, Ill.	1901
Newell, F. H.	U. S. Geological Survey, Washington, D. C.	1897
Newman, G. A., M. D.	New London, Minn.	1899
New York Public Library	40 Lafayette Place, New York, N. Y.	1898
Nolte, Arthur, M. D.	1505 State St., New Orleans, La.	1901
Nunn, R. J., M. D.	5 York St. East, Savannah, Ga.	1881
*Nuttal, George H. F., M. D.,	3 Cranmer St., Pathological Laby, New Museum, Cambridge, Eng.	1891

Ohage, Justus, M. D.	7th and Waconta Sts., St. Paul, Minn.	1899
Oliphant, Samuel R., M. D.	147 Baronne St., New Orleans, La.	1902
Otis, Edward Osgood, M. D.	381 Beacon St., Boston, Mass.	1894
Owen, James, C. E.	Montclair, N. J.	1901
Parham, F. W., M. D.	609 Macheca Bldg., New Orleans, La.	1902
*Park, Wm. H., M. D.	315 W. 76th St., New York, N. Y.	1899
*Parker, Horatio N.	Montclair, N. J.	1900
Parmelee, Chas. L.	136 Liberty St., New York, N. Y.	1899
Parry, Eleanor, M. D.	Mt. Holyoke College, South Hadley, Mass.	1901
Patton, George F., M. D.	1134 Camp St., New Orleans, La.	1902
*Pearson, Leonard, V. M. D.	3608 Pine St., Philadelphia, Pa.	1897
*Pease, Herbert D., M. D.	116 Washington Ave., Albany, N. Y.	1897
Peck, George, M. D., U. S. N.	926 North Broad St., Elizabeth, N. J.	1890
Pelletier, Elzear, M. D.	76 St. Gabriel St., Montreal, P. Q.	1902
Pelletier, P., M. D.	79 Bowen Ave., Sherbrooke, P. Q.	1902
Pennsylvania R. R. Relief Dept.	Philadelphia, Pa.	1899
*Perkins, Roger G., M. D.	1527 Euclid Ave., Cleveland, Ohio.	1902

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* Also members of Section of Bacteriology and Chemistry.

Perry, J. C., M. D.	U. S. P. H. and M. H. S., Washington, D. C.	1903
*Phelps, Earle B.	Mass. Inst. Tech., Boston, Mass.	1902
Pierce, Claude C., M. D.	P. H. and M. H. S., Mullett Key, Fla.	1902
Pina, Manuel Garcia, M. D.	Cordoba, Mex.	1902
*Porter, John Lewis	604 Carondelet St., New Orleans, La.	1902
Porter, Joseph Y., M. D.	Jacksonville, Fla.	1878
Pothier, O. J., M. D.	124 Baronne St., New Orleans, La.	1902
Powell, D. T., M. D.	Thayer, Mo.	1902
Powell, Thomas, M. D.	217 Laughlin Block, Los Angeles, Cal.	1903
Prado, Ramon N., M. D.	Mexico City, Mex.	1902
*Prescott, Samuel C.	Mass. Institute Technology, Boston, Mass.	1902
Price, Marshall Langton, M. D.	10 South St., Baltimore, Md.	1903
Probst, C. O., M. D.	Columbus, Ohio.	1886
*Prudden, T. Mitchell, M. D.	160 West 59th St., New York, N. Y.	1899
Putnam, Helen C., M. D.	127 Angell St., Providence, R. I.	1901
Ramirez, Jose, M. D.	Mexico City, Mex.	1902
*Ravenel, M. P., M. D.	908 Pine St., Philadelphia, Pa.	1897
Raymond, Joseph H., M. D.	145 Willow St., Brooklyn, N. Y.	1882
Repp, John J., V. M. D.	Ames, Iowa.	1899
Reyburn, Robert, M. D.	2129 F St., Washington, D. C.	1903
Reynolds, A. R., M. D.	Chicago, Ill.	1893
Reynolds, M. H., V. M. D.	St. Anthony Park, Minn.	1899
Rice, A. J., M. D.	707 Mason St., San Francisco, Cal.	1902
Richard, Charles, M. D.	Manila, P. I.	1900
Richards, Edgar	16 Lafayette Sq., Washington, D. C.	1889
*Richards, Mrs. E. H.	Mass. Institute of Technology, Boston, Mass.	1888
Richardson, Maj. Henry B., C. E.	New Orleans, La.	1880
Richardson, W. L., M. D.	225 Commonwealth Ave., Boston, Mass.	1875
*Rickards, Burt Ransom, S. B.	739 Boylston St., Boston, Mass.	1901
Rives, William C., M. D.	1723 I St., Washington, D. C.	1885
Rixey, P. M., M. D.	U. S. Navy, Washington, D. C.	1903
Roberts, Charles F., M. D.	250 W. 57th St., New York, N. Y.	1892
*Robin, Albert, M. D.	817 Adams St., Wilmington, Del.	1899
*Robinson, Prof. Franklin C.	Brunswick, Me.	1889
Robinson, John Franklin, M. D.	Manchester, N. H.	1894
Ross, John Walton, M. D.	Ancon, Panama.	1902
Ruiz, Luis E., M. D.	c Roma 2049, Mexico, Mex.	1902
*Russell, H. L.	Madison, Wis.	1899
Russell, James Percy, M. D.	Augusta, Me.	1903
Russell, Julia Wallace, M. D.	44 Pleasant St., Concord, N. H.	1892
Rutherford, J. G., M. D.	Ottawa, Ont.	1902
Salmon, D. E., D. V. M.	Bureau Animal Industry, Washington, D. C.	1883
Salmon, Thomas W., M. D.	U. S. P. H. and M. H. S., Wash., D. C.	1903
Salomon, Lucien F., M. D.	2013 Prytania St., New Orleans, La.	1902
Samostz, Oscar	426 South 13th St., Philadelphia, Pa.	1902
Schaffner, Fred. Lawrence, M. D.	Boissevain, Manitoba.	1902
Schoonover, Warren, M. D.	115 East 59th St., New York, N. Y.	1895

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Schulz, F. M., M. D....................663 16th St., Milwaukee, Wis. 1901
Scott, Joseph J., M. D...........1808 Prytania St., New Orleans, La. 1902
Seaman, Louis L., M. D...........247 Fifth Ave., New York, N. Y. 1901
*Sedgwick, Prof. W. T.................491 Boylston St., Boston, Mass. 1902
Shea, Thomas B., M. D.................182 Warren St., Boston, Mass. 1900
Shepard, Charles H., M. D........Columbia Heights, Brooklyn, N. Y. 1892
Shrader, John C., M. D............................Iowa City, Iowa. 1890
Shute, George Percival, S. E........................Columbus, Ohio. 1903
Simon, F., M. D.......................836 Spring St., Buffalo, N. Y. 1901
Smart, J. H., M. D......................................Dallas, Tex. 1902
Smersh, F. M., M. D..................................Owatonna, Minn. 1899
*Smith, Erastus G., Ph. D.............................Beloit, Wis. 1901
Smith, Frederick W., M. D........700 South West St., Syracuse, N. Y. 1896
*Smith, Herbert E., M. D....Med. Dept. Yale Univ., New Haven, Conn. 1899
Smith, Joseph Rome, M. D.........2300 Delancey St., Philadelphia, Pa. 1902
*Smith, Theobald, M. D...................Forest Hills, Boston, Mass. 1899
Smith, T. Guilford.................9 German Ins. Bldg., Buffalo, N. Y. 1896
Smith, Wm. F., M. D...................................Orient, L. I. 1901
Smock, Prof. John C.................................Trenton, N. J. 1899
*Snodgras, C. A., M. D.................City Hospital, St. Louis, Mo. 1902
Soper, Geo. A., Ph. D................29 Broadway, New York, N. Y. 1900
Soto, Alberto Garduno, M. D................Juarez 14, Toluca, Mex. 1903
Souchon, Edmond, M. D........204 Carondelet St., New Orleans, La. 1902
Spaulding, Heman, M. D.......................City Hall, Chicago, Ill. 1900
Spencer, Leonard E., M. D...........................Wausau, Wis. 1903
Stanton, Byron, M. D..............931 Dayton St., Cincinnati, Ohio. 1889
Stark, A. N., M. D....................U. S. Army, West Point, N. Y. 1902
*Starkey, T. A., M. D................McGill Univ., Montreal, P. Q. 1902
*Stebbins, James H., Ph. D...........27 East 22d St., New York, N. Y. 1900
*Stengel, Alfred, M. D............Pepper Laboratory, Philadelphia, Pa. 1899
*Sternberg, Geo. M. M. D......2144 California Ave., Washington, D. C. 1874
*Stokes, Wm. R., M. D..............................Baltimore, Md. 1899
*Stone, Bingham H., M. D..........................Burlington, Vt. 1900
Strauss, Nathan..........Broadway and 34th St., New York, N. Y. 1903
Stuart, T. A..............State Department of Health, Albany, N. Y. 1902
Suiter, A. Walter, M. D............................Herkimer, N. Y. 1894
Suiter, F. C., M. D..................................La Crosse, Wis. 1899
Sutherland, Quincy Orlin, M. D....73 Milwaukee St., Janesville, Wis. 1895
*Swarts, Gardner Taber, M. D......................Providence, R. I. 1894
Sylvester, Ira W., C. E.............................Alexandria, La. 1903
Syracuse University.................................Syracuse, N. Y. 1899

Talbot, Marion ....University of Chicago, Chicago, Ill. 1893
Thau, A. Blair, M. D.............................Santa Barbara, Cal. 1901
Thomas, John Newton, M. D.......................Quarantine, La. 1903
Towne, S. R., M. D....................................Omaha, Neb. 1895
Townsend, Joseph H., M. D.........39 College St., New Haven, Conn. 1901
Troncosa, Manuel Uribe, M. D...........Tacuba 14, Mexico, Mex. 1903
Tucker, William C., S. E.........156 Fifth Ave., New York, N. Y. 1903
Turnbull, Thomas, M. D...........314 Western Ave., Allegheny, Pa. 1897

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Underwood, Wm. Lyman	Belmont, Mass,	1902
Urena, Jesus Gonzales, M. D	Mexico City, Mex.	1902
Urrutia, J. Joaquin, M. D.	14 Lafragua St., Puebla, Mex.	1902
Utley, Edward R., M. D	Newton, Mass.	1898
Valdez, Ulises, M. D	San Juan de Dios 267, Mexico, Mex.	1903
Valentine, Fred. C., M. D	31 W. 6th St., New York, N. Y.	1896
Wade, John W., M. D	318 No. 2d St., Millville, N. J.	1897
Wales, George R	Bellows Falls, Vt.	1903
Walcott, Henry P., M. D	Cambridge, Mass.	1880
Warner, Frank, M. D	Columbus, Ohio.	1899
*Wasdin, Eugene, M. D	U. S. M. Hospital, Buffalo, N. Y.	1901
Watson, Irving A., M. D	Concord, N. H.	1881
Wertenbaker, Charles P., M. D.,	U. S. Marine Hospital, New Orleans, La.	1902
*Wesbrook Frank F., M. D	Minneapolis, Minn.	1897
*Weston, Robert Spurr	14 Beacon St., Boston, Mass.	1896
*Whipple, Geo. C	220 Broadway, New York, N. Y.	1899
White, Alfred T., M. D	130 Water St., New York, N. Y.	1899
White, William A., M. D	Box 619, New York, N. Y.	1888
Whitney, Eli	New Haven, Conn.	1900
Wilbur, Cressy L., M. D	Lansing, Mich.	1894
*Wiley, H. W	1314 10th St. N. W., Washington, D. C.	1901
*Williams, Herbert U., M. D	24 High St., Buffalo, N. Y.	1901
Williams, Tom A., M. D	Rice Hotel, Houston, Tex.	1902
Wilkinson, C. P., M. D	1402 Peters Ave., New Orleans, La.	1889
Willcox, W. F	Cornell University, Ithaca, N. Y.	1899
*Wilson, Ezra H., M. D	Hoagland Laboratory, Brooklyn, N. Y.	1897
*Wilson, Robert, Jr., M. D	165 Rutledge Ave., Charleston, S. C.	1901
Wiltse, M. J., M. D	Burlington, Vt.	1901
Wingate, U. O. B., M. D	204 Biddle St., Milwaukee, Wis.	1890
*Winslow, C.-E. A	Hotel Oxford, Boston, Mass.	1902
Wishard, William N., M. D	Indianapolis, Ind.	1901
Wood, Alfred Vincent	177 Glqucester St., Brunswick, Ga.	1892
Wood, Mrs. C. P	108 Powell Ave., Evansville, Ind.	1900
Wood, Prof. Edward S	Harvard Medical School, Boston, Mass.	1895
Woodbridge, S. Homer	3 Hamilton Pl., Boston, Mass.	1895
Woodhull, Gen. A. A. M. D., U. S. A	Princeton, N. J.	1874
Woodward, William C., M. D	Washington, D. C.	1896
Worcester Free Library	Worcester, Mass.	1897
Wright, Frank W., M. D	48 Pearl St., New Haven, Conn.	1889
Wright, John W., M. D	Erie, Pa.	1897
Wroth, James H., M. D	Albuquerque, N. M.	1902
Wyman, Walter, M. D	P. H. and M. H. S., Washington, D. C.	1884
Young, A. G., M. D	Augusta, Me.	1885

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Henry Lomb	Rochester, N. Y.	1884

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Moore, Eduardo, M. D	Santiago de Chili, Republic of Chili.	1902

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Alenan, Jose M., M. D...............................Havana, Cuba.
Armas, Julian, M. D........... ....63 Reina St., Havana, Cuba.
Arostegui, Gonzalo, M. D.... ......23 Amargura St., Havana, Cuba.
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Ashford, Bailey K., M. D..............U. S. Army, Washington, D. C.

Ballou, Rev. Henry L.............................Chester, Vermont.
Barnet, Enrique B., M. D..............29 St. Rafael St., Havana, Cuba.
Barrosa, Luis, M. D..................44 Amargura St., Havana, Cuba.
Bartol, John W., M. D..... ....48 Chestnut St., Boston, Mass.
Bazan, Virgilio de Zayas, D. D. S.,.....95 Obispo St., Havana, Cuba.
Beatty, T. B., M. D...........509 E. First St., Salt Lake City, Utah.
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*Beyer, Henry E, M. D............Hotel Albany, Washington, D. C.
Bisbal, Carlos L., M. D............Farmacia S. Isabel, Havana, Cuba.
Bosque, A. C., M. D..................36 Tejadillo St., Havana, Cuba.
Bryant, William S., M. D............48 40th St., New York, N. Y.

Calves, Fernando, M. D............43 St. Ignacio St., Havana, Cuba.
Canals, Jose Antonio, C. E.... ....San Juan, Porto Rico.
Capote, Fernando Mendez, M. D.....72 St. Miguel St., Havana, Cuba.
Casanova, Jose N., M. D...............Malecon H 2, Havana, Cuba.
Castellanos, Manuel S., M. D........124 Escobar St., Havana, Cuba.
Catellier, Laurent, M. D.... ....Quebec, Que.
Chabau, Lorenzo, M. D.............43 St. Ignacio St., Havana, Cuba.
Chassaignac, Charles, M. D.......830 Canal St., New Orleans, La.
Coops, Frank H., M. D............12 Reynolds St., Danielson, Conn.
Cordova, Federico, M. D..............32 Virtudes St., Havana, Cuba.
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Darey, J. Herbert, M. D...504 Metropolitan Block, Sioux City, Iowa.
de Aragon, Ernesto, M. D...............59 Salud St., Havana, Cuba.
de Garay, Adrian, M. D...............No. 4 Leon, Mexico City, Mex.
Dehogues, Jorge L., M. D...............96 Aguila St., Havana, Cuba.
de la Guardia, Vicente, M. D ...19 y D. Vedado St., Havana, Cuba.
de Leon, Abelardo, M. D... ......150 Compostella St., Havana, Cuba.
Delfin, Manuel, M. D..... ......120 A Industria St., Havana, Cuba.
Delgado, Claudos, M. D.................503 Monte St., Havana, Cuba.
de los Reyes, Gustavo, M. D............72 Neptuno St., Havana, Cuba.
de Quesada, Gregorio J., M. D.......83 Trocadero St., Havana, Cuba.
del Rio, Narcisco, M. D..........................Vera Cruz, Mex.
del Valle, Jose Antonio Lopez, M. D ..44 Gallano St., Havana, Cuba.
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de Velasco, Francisco Javier, M. D...14 Trocadero St., Havana, Cuba.
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Dominguez, Guillerono, M. D..... .....33 Prado St., Havana, Cuba.
Duenas, Joaquin L., M. D....... ....16 Trocadero St., Havana, Cuba.
Duque, Matias, M. D................92 Consulado St., Havana, Cuba.

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Finlay, C. E., M. D....................128 Reina St., Havana, Cuba.
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*Frost, William Dodge, Ph. D.........310 N. Bruen St., Madison, Wis.

Garcia, Gabriel M., M. D................113 Cuba St., Havana, Cuba.
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Jacobsen, Joaquin L., M. D...........2 Monserrate St., Havana, Cuba.
Jaime, Oscar, M. D...................147 Animas St., Havana, Cuba.
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Kaye, James Robert, M. D.....County Medical Officer, Wakefield, Eng.
Kohly, Charles E., M. D.............473 Monte St., Havana, Cuba.
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Laine, D. T., M. D......................70 Prado St., Havana, Cuba.
*Lebredo, Mario G., M. D..........Las Animas Hospital, Havana, Cuba.
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McKenzie, T. H., C. E.........................Southington, Conn.
Marcley, Walter J., M. D...........................Rutland, Mass.
Marsh, Geo. F...Chester, Vt.
Menocal, D. Luis, M. D.............46 Concordia St., Havana, Cuba.
Menocal, Francisco E., M. D............Machina St., Havana, Cuba.
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Moore, Richard C., M. D...........312 McCague Bldg., Omaha, Neb.
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Pedro, Juan Luis, M. D................68 Habana St., Havana, Cuba.
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Pla, Jose A...............................69 Vedado 9th, Havana, Cuba.
Pla, Juan Miguel, M. D...............69 Vedado 9th, Havana, Cuba.
Plasencia, Ignacio, M. D...........50 Empedrado St., Havana, Cuba.
*Polhamus, W. Elson, M. D.............J. Vedado St., Havana, Cuba.
Ponce, Jorge, M. D.................88 San Lazaro St., Havana, Cuba.
Ponce de Leon, Nestor J., M. D........................Havana, Cuba.
Preciado, Alfonso, M. D..........................Panama, Panama.
Primelles, Benjamin, M. D.............15 Esquina St., Havana, Cuba.
Pruneda, Alfonso, M. D........2 Montealegre St., Mexico, Mexico.
Pulgaron, Hector A., M. D.............86 Cuba St., Havana, Cuba.

Rebelin, Henry, M. D..............91 Jesus Maria St., Havana, Cuba.
Rensoli, Fernando, M. D............138 Neptuno St., Havana, Cuba.
Roberts, Hugo, M. D...................27 Animas St., Havana, Cuba.
Robins, Vernon, M. D..................717 Second St., Louisville, Ky.

†San Martin, Julio, M. D...........125 Manrique St., Havana, Cuba.
Sarvin, Luther Robinson..................Box 11, Katonah, N. Y.
Sherman, Walter J., C. E............613 Nasby Bldg., Toledo, Ohio.
Sherwood, F. E., M. D.................................Albion, N. Y.
Stiles, Charles Wardell, Ph. D.,
25th and E Sts. N. W., Washington, D. C.
Tobey, H. A., M. D........ ..Supt. State Hospital, Toledo, Ohio.
Torralbas, Frederick, M. D.........23 Compostela St., Havana, Cuba.
Tuttle, Thomas D., M. D...........................Billings, Mont.

Valdes, Garcia Emilio, M. D.............7 Crespo St., Havana, Cuba.
Venero, Pantaleon, M. D............119 Industria St., Havana, Cuba.
Vildosola, Francisco J...............97 Compostela St., Havana, Cuba.
Villalonga, Jose Lopez, M. D..........89 Galiano St., Havana, Cuba.
Vrooman, Morrell, C. E...............42 Main St., Gloversville, N. Y.

Way, J. Howell, M. D............................Waynesville, N. C.
*Williams, Anna W., M. D..........342 71st St. W., New York, N. Y.
Wilson, Erastus, M. D..................108 Monte St., Havana, Cuba.
Whyte, Wm. J., M. D..............500 Second St., Watertown, Wis.
Wirt, Wm. E., M. D..............42 Glen Park Place, Cleveland, Ohio.

y Montane, Francisco Etchegoyen, D. V. M.,
85 Amistad St., Havana, Cuba.

Zequeira, Jose Varela, M. D...........34 Prado St., Havana, Cuba.
Zimmerman, C. P......................... ....Newark, N. J.

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* Also members of Section of Bacteriology and Chemistry.

† Died in March, 1906.

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ALABAMA.

Dr. W. H. Sanders, *State Health Officer,* Montgomery. (The Medical Association of the State of Alabama constitutes the State Board of Health, with a committee of ten (10) members, called "A Public Health Committee," to represent and act for the Board during the intervals of its sessions.)

DISTRICT OF ALASKA.

(Has no District Board of Health.)

ARIZONA.

[Territorial Board of Health.]

Joseph H. Kibbey, Governor, *President,* Phoenix, Arizona; E. S. Clark, Attorney General, *Vice-President,* Prescott; Dr. William Duffield, *Supt. and Secretary,* Phoenix, Arizona.

ARKANSAS.

Dr. G. M. D. Cantrell, *President,* Little Rock; Dr. R. B. Christian, *Secretary,* Little Rock; Dr. W. H. Miller, Little Rock; Dr. W. B. Hughes, Little Rock; Dr. Wm. W. Jackson, Jonesboro; Dr. J. R. Lynn, Hazen.

CALIFORNIA.

Martin Regensburger, M. D., *President,* San Francisco; Wallace A. Briggs, M. D., Sacramento; A. C. Hart, M. D., Sacramento; F. K. Ainsworth, M. D., San Francisco; O. Stansbury, M. D., Chico; W. Le Moyne Wills M. D., Los Angeles; N. K. Foster, M. D., *Secretary,* Sacramento.

COLORADO.

Wm. H. Davis, M. D., *President,* Denver; George E. Stemen, M. D., *Vice-President and Medical Inspector,* Denver; Hugh L. Taylor, M. D., *Secretary* and *Executive Officer,* Denver; F. N. Carrier, M. D., *Treasurer,* Canon City; Mark H. Sears, M. D., *Medical Inspector,* Denver; Oliver J. Mayne, M. D., Como; J. Tracy Melvin, M. D., Saguache; Minnie C. T. Love, M. D., Denver; L. E. Lemen, M. D., Denver; J. N. Hall, M. D., *Consultant in State Medicine,* Denver; Wm. C. Mitchell, M. D., *Bacteriologist,* Denver; Phillip Hillkowitz, M. D., *Chemist,* Denver; A. L. Bennett, M. D., *Chinese Medical Inspector,* Denver; George D. James, *Civil Engineer,* Denver.

CONNECTICUT.

Prof. Wm. H. Brewer, Ph. D., LL. D., *President,* New Haven; Prof. C. A. Lindsley, M. D., A. M., *Secretary,* New Haven; T. H. McKenzie, Esq., Southington; E. K. Root, M. D., Hartford; H. G. Newton, B. A. Esq., New Haven; J. H. Townsend, M. D., New Haven; A. W. Phillips, M. D., Derby.

DELAWARE.

Dr. E. W. Cooper, *President,* Camden; Dr. A. E. Frantz, Wilmington; Dr. W. F. Haines, Seaford; Dr. Alex. Lowber, *Secretary and Executive Officer,* Wilmington; Dr. J. W. Clifton, Smyrna; Dr. J. W. DeWitt, St. Georges; Dr. A. J. Fleetwood, Laurel.

DISTRICT OF COLUMBIA.

Dr. William C. Woodward, *Health Officer,* Washington, D. C.

FLORIDA.

Hon. E. M. Hendry, Tampa; Hon. Horace L. Simpson, M. D., Pensacola; Joseph Y. Porter, M. D., *Secretary and State Health Officer,* Jacksonville and Key West.

GEORGIA.

Dr. W. F. Westmoreland, *President,* Atlanta; Dr. Charles Hicks, *Vice President,* Dublin; Dr. H. F. Harris, *Secretary,* Atlanta; Dr. W. W. Owens, Savannah; Dr. A. P. Taylor, Thomasville; Dr. M. S. Brown, Fort Valley; Dr. W. W. Stewart, Columbus; Dr. Howard J. Williams, Macon; Dr. R. M. Harbin, Rome; Dr. Samuel C. Benedict, Athens; Dr. Giles Hathcock, Bellton; Dr. J. B. Morgan, Augusta.

HAWAII.

(Territorial Board of Health.)

Dr. C. B. Cooper, *President;* Dr. J. S. B. Pratt, *City Health Officer;* C. Charloch, *Secretary;* Dr. W. H. Mays, L. Andrews, Esq., M. P. Robinson, Esq., F. C. Smith, Esq., E. C. Winston, Esq., S. K. Kane, Esq. Office of the Board is in Honolulu.

IDAHO.

Idaho has no State Board of Health, nor is there any one acting in lieu of such board. A statute authorizes the Board of County Commissioners in each county to appoint a County Physician, who, together with the Board of Commissioners, constitute a board of health. This board has jurisdiction in the county only.

ILLINOIS.

Geo. W. Webster, M. D., *President,* Chicago; James A. Egan, M. D. *Secretary,* Springfield; R. E. Niederinghaus, M. D., Granite City; W. Harrison Hipp, M. D., Chicago; P. H. Wessel, M. D., Moline; Henry Richings, M. D., Rockford; J. C. Sullivan, M. D., Cairo.

INDIANA.

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IOWA.

Charles W. Mullan, Attorney-General, Waterloo; Paul O. Koto, Forest City, State Vet. Surgeon; Charles Francis, C. E., Davenport; H. Matthey, M. D., *President,* Davenport; R. E. Conniff, M. D., Sioux City; Fred. W. Powers, M. D., Waterloo; J. H. Sams, M. D., Clarion; A. M. Linn, M. D., Des Moines; A. P. Hanchett, M. D., Council Bluffs; A. C. Moerke, M. D., Burlington; J. F. Kennedy, M. D., *Secretary,* Des Moines.

KANSAS.

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KENTUCKY.

Dr. Joseph M. Mathews, Louisville, *President;* Dr. William Bailey, Louisville; Dr. George T. Fuller, Mayfield; Dr. Chester Mayer, Louisville; Dr. I. A. Shirley, Winchester; Dr. Wm. A. Quinn, Henderson; Dr. K. W. Coffman, Owensboro; Dr. J. N. McCormack, Bowling Green, *Secretary.*

LOUISIANA.

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MAINE.

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MARYLAND.

Dr. Wm. H. Welch, *President*, Baltimore; Dr. John S. Fulton, *Secretary*, Baltimore; Dr. Eugene Jones, Kensington; Dr. James Bosley (ex-officio), Commissioner of Health of Baltimore City; Mr. H. Douglas Thomas, Jr., Baltimore; Hon. William Shephard Bryan, (ex-officio), Attorney-General, Baltimore; Dr. E. J. Dirickson, Berlin.

MASSACHUSETTS.

Henry P. Walcott, M. D., *Chairman*, Cambridge; Julian A. Mead, M. D., Watertown; Hiram F. Mills, C. E.., Lawrence; John W. Bartol, M. D., Boston; Gerard C. Tobey, Esq., Wareham; James W. Hull, Pittsfield; Charles H. Porter, Quincy; Charles Harrington, M. D., *Secretary*, Boston.

MICHIGAN.

Victor C. Vaughan, M. D., *President*, Ann Arbor; Charles M. Ranger, A. B., Battle Creek; Aaron R. Wheeler, M. D., St. Louis; Angus McLean, M. D., Detroit; Malcolm C. Sinclair, M. D., Grand Rapids; Hon. Coleman C. Vaughan, St. Johns; Frank W. Shumway, M. D., *Secretary*, Lansing.

MINNESOTA.

Henry Hutchinson, M. D., *President*, St. Paul; W. H. Rowe, M. D., *Vice-President*, St. James; H. M. Bracken, M. D., *Secretary and Executive Officer*, St. Paul; C. W. More, M. D., Eveleth; M. McKinnon, M. D., Fosston; Edw. Schumpik, D. D. S., Minneapolis; J. B. McGaughey, M. D., Winona; Frederick N. Hunt, M. D., Blue Earth; Christopher Graham, M. D., Rochester.

MISSISSIPPI.

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MISSOURI.

Dr. R. H. Goodier, *President*, Hannibal; Dr. D. T. Powell, *Vice-President*, Thayer; Dr. J. A. B. Adcock, *Secretary*, Warrensburg; Dr. J. T. Thatcher, Oregon; Dr. M. M. Hamlin, St. Louis; Dr. W. S. Thompson, Armstrong; Dr. P. Y. Tupper, St. Louis.

MONTANA.

Hon. Joseph K. Toole, Governor, (ex-officio), Helena; Hon. Albert J. Galen, Attorney-General, (ex-officio), Helena; Dr. William Treacy, *President*, Helena; Dr. Thomas D. Tuttle, *Secretary*, Billings; Dr. LeRoy Southmayd, Great Falls; Dr. T. J. Sullivan, Butte; Mr. J. W. Wade, C. E., Helena.

NEBRASKA.

Benj. F. Bailey, M. D., *President,* Lincoln; W. T. Johnson, M. D., Pawnee City; A. B. Somers, M. D., *Treasurer,* Omaha; Geo. H. Brash, M. D. *Secretary,* Beatrice; S. R. Towne, M. D., Omaha, *State Health Inspector.*

NEVADA.

S. C. Gibson, M. D., *President,* Reno; W. L. Samuels, M. D., *Vice-President,* Winnemucca; S. L. Lee, M. D., *Secretary,* Carson City.

NEW HAMPSHIRE.

Governor Nahum J. Bachelder, Andover; Attorney-General E. G. Eastman, Exeter; G. P. Conn, M. D., *President,* Concord; Chas. S. Collins, M. D., Nashua; Robert Fletcher, C. E., Hanover; Irving A. Watson, M. D., *Secretary,* Concord.

NEW JERSEY.

Cyrus F. Brackett, M. D., LL. D., *President,* Princeton; the Secretary of State, the Attorney-General, the State Geologist, members ex-officio; Laban Dennis, M. D., Newark; Henry B. Rue, M. D., Hoboken; Henry W. Elmer, M. D., Bridgeton; Wm. H. Murray, M. D., Plainfield; George P. Olcott, C. E., East Orange; Henry Mitchell, M. D., *Secretary* and *Medical Superintendent of Vital Statistics.* The office of the Board is in the State House, Trenton.

NEW MEXICO.

Dr. G. W. Harrison, *President,* Albuquerque; Dr. T. B. Hart, *Vice President,* Raton; Dr. W. D. Radcliffe, *Treasurer,* Belen; Dr. C. D. Black, *Secretary,* Las Vegas; Dr. J. H. Sloan, Santa Fe; Dr. G. C. Bryan, Alamogorda; Dr. J. J. Shuler, Raton.

NEW YORK.

(State Department of Health.)

Dr. Eugene H. Porter, *Commissioner of Health,* New York; T. A. Stuart, *Chief Clerk,* Albany.

NORTH CAROLINA.

Geo. G. Thomas, M. D., *President,* Wilmington; S. Westray Battle, M. D., Asheville; Henry W. Lewis, M. D., Jackson; Thos. E. Anderson, M. D., Statesville; W. P. Ivey, M. D., Lenoir; J. Howell Way, M. D., Waynesville; W. O. Spencer, M. D., Winston-Salem; J. L. Ludlow, C. E., Winston-Salem; Richard H. Lewis, M. D., *Secretary* and *Treasurer,* Raleigh.

NORTH DAKOTA.

C. N. Frich, *President,* Bismarck; E. C. Haagenson, Hillsboro; H. H. Healey, M. D., *Superintendent* and *Secretary,* Grand Forks.

OHIO.

Frank Warner, M. D., Columbus, *President;* W. C. Chapman, M. D., Toledo, *Vice President;* Josiah Hartzell, Ph. D., Canton; Darwin G. Palmer, M. D., Geneva; Byron Stanton, M. D., Cincinnati; J. C. Crossland, M. D., Zanesville; Wm. T. Miller, M. D., Cleveland; C. O. Probst, M. D., Columbus, *Secretary.*

OKLAHOMA TERRITORY.

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OREGON.

Dr. Andrew C. Smith, *President,* Portland; Dr. E. A. Pierce, *Vice President,* Salem; Dr. Woods-Hutchinson, *Secretary,* Portland; Dr. Alfred Kinney, Astoria; Dr. E. B. Pickel, Medford; Dr. Harry Lane, Portland; Dr. C. J. Smith, Pendleton.

PENNSYLVANIA.

(Department of Health.)

Samuel G. Dixon, M. D., Ardmore, *Commissioner of Health;* Benjamin Lee, M. D., Philadelphia, *Assistant to the Commissioner;* Fred. C. Johnson, M. D., Bradford, *Chief of the Division of Inspecting, Quarantining and Disinfecting;* Wilbur Morse, Ardmore, *Secretary to the Commissioner. Advisory Board:* Samuel T. Davis, M. D., Lancaster; Adolph Koenig, M. D., Pittsburg; Lee Masterson, C. E., Johnstown; Leonard Pearson, M. D., Philadelphia; Charles B. Penrose, M. D., Philadelphia; B. W. Warren, M. D., Westchester.

PHILIPPINE ISLANDS.

(Insular Board of Health.)

Maj. E. C. Carter, M. D., U. S. Army, *Commissioner of Health* J. D. Fauntleroy, *Sanitary Engineer;* T. R. Marshall, M. D., *Chief Health Inspector;* P. C. Freer, M. D., Ph. D., *Superintendent Government Laboratories;* Manuel Gomez Martinez, M. D., *Secretary.* Office of the Board is in Manila.

PORTO RICO.

(Superior Board of Health.)

Dr. Jose Gomez Briose, *Director of Health, Charities and Corrections;* Dr. Francisco R. de Geonaga, *Acting Supervisor of Health. Members of the Board:* Dr. F. R. de Geonaga, Dr. Estaban Saldana, Mr. Juan Hernandez Lopez, Mr. Fidel Guillermety. Office of the Board is in San Juan.

RHODE ISLAND.

Albert G. Sprague, M. D., *President,* Riverpoint; Samuel M. Gray, C. E., Providence; Alexander B. Briggs, M. D., Ashaway; Rev. George L. Locke, Bristol; John C. Budlong, M. D., Providence; Rufus E. Darrah, Newport; Gardner T. Swarts, M. D., *Secretary,* Providence.

SOUTH CAROLINA.

T. Grange Simons, M. D., *Chairman,* Charleston; A. A. Moore, M. D., Camden; James Evans, M. D., *Secretary,* Florence; W. H. Nardin, Anderson; Chas. M. Rees, M. D., Charleston; George R. Dean, M. D., Spartanburg; Robert Wilson, M. D., Charleston; Hon. U. X. Gunter, Attorney-General; Hon. A. W. Jones, Comptroller General.

SOUTH DAKOTA.

J. W. Ellis, *President,* Elk Point; H. A. Peabody, *Vice President,* Webster; D. W. Robinson, *Superintendent* and Ex-Officio *Secretary,* Pierre; L. F. Babcock, Deadwood; W. E. Moore, Tyndall.

TENNESSEE.

W. J. McMurray, M. D., *President,* Nashville; Heber Jones, M. D., *Vice-President,* Memphis; J. A. Albright, M. D., *Secretary and Executive Officer,* Nashville; Louis Leroy, M. D., *State Bacteriologist,* Nashville; T. E. Abernathy, M. D., Chattanooga; W. W. Ogilvie, Nashville. The Secretary is not a member of the Board.

TEXAS.

[State Health Department.]

Dr. George R. Tabor, *State Health Officer,* Austin; Emmett E. Walker, *Clerk,* Austin.

UTAH.

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VERMONT.

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VIRGINIA.

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WASHINGTON.

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WEST VIRGINIA.

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WISCONSIN.

Wm. F. Whyte, M. D., *President,* Watertown; C. A. Harper, M. D., *Secretary and Executive Officer,* Madison; E. S. Hayes, M. D., Eau Claire; U. O. B.

Wingate, M. D., Milwaukee; Q. O. Sutherland, M. D., Janesville; L. E. Spencer, M. D., Wausau; H. A. Meilike, M. D., Clintonville.

WYOMING.

Dr. Fred Horton, ***President,*** Newcastle; Dr. A. W. Barber, ***Secretary and Executive Officer,*** Cheyenne; Dr. J. L. Wicks, Evanston.

SANITARY ASSOCIATIONS.

CALIFORNIA PUBLIC HEALTH ASSOCIATION.

Dr. Edward von Adelung, *President,* Oakland; Dr. William Simpson, *Vice-President,* San Jose; Dr. N. K. Foster, *Secretary and Treasurer,* Sacramento.

INDIANA.

There is no voluntary State Sanitary Association. There are held under the auspices of the State Board of Health two health officers' schools annually. In June the school for county and city health officers is held. In December the health officers' school for town health officers, is held.

IOWA ASSOCIATION OF HEALTH OFFICERS.

Dr. L. A. Thomas, Red Oak, *President;* Dr. Geo. P. Neal, Ft. Madison, *Vice President;* Dr. C. T. Lesan, Mount Ayr, *Secretary* and *Treasurer.*

KANSAS.

The State Board of Health has an annual conference with county and municipal health officers. The second annual conference was held in Topeka, June 27, 1905.

LOUISIANA STATE SANITARY ASSOCIATION.

Dr. James W. Dupree, *President,* Baton Rouge; Dr. Rudolph Matas, *First Vice President,* New Orleans; Dr. John N. Thomas, *Second Vice President,* Quarantine; Dr. W. G. Owen, *Third Vice President,* White Castle; Dr. Robert L. Randolph, *Fourth Vice President,* Alexandria; Dr. N. K. Vance, *Fifth Vice President,* Shreveport; Dr. W. H. Dalrymple, *Sixth Vice President,* Baton Rouge; Dr. C. P. Ducote, *Seventh Vice President,* Cottonport; Dr. Benj. A. Littell, *Treasurer,* Opelousa; Dr. Frederick J. Mayer, *Secretary,* Opelousa.

MARYLAND PUBLIC HEALTH ASSOCIATION.

Dr. Thos. B. Owings, *President,* Ellicott City; Dr. Roger Brooke, Sandy Spring; Dr. F. H. Thompson, Annapolis; Dr. C. R. Scheller, Hagerstown; Dr. E. J. Dirickson, Berlin; Dr. Chas. O'Donovan, Baltimore, *Vice Presidents;* Dr. W. R. Stokes, Baltimore, *Treasurer;* Dr. John S. Fulton, and Dr. Marshall L. Price, Baltimore, *Secretaries.*

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH.

Dr. H. P. Walcott, *President,* Cambridge; Dr. S. H. Durgin, *First Vice President,* Boston; —————— *Second Vice President,* Boston; James C. Coffey, *Secretary,* Wooster; Dr. James B. Field, *Treasurer,* Lowell.

MICHIGAN.

Sanitary conventions held one or more times each year at different towns in the State.

MINNESOTA STATE SANITARY ASSOCIATION.

[Organized 1892.]

F. F. Wesbrook, M. D., *President,* University of Minnesota, Minneapolis; G. L. Wilson, *First Vice President,* St. Paul; T. S. Roberts, M. D., *Second Vice President,* Minneapolis; E. H. Bayley, M. D., *Secretary.* Lake City; Frank Corbett, M. D., *Treasurer,* Minneapolis. Executive Committee: Prof. G. Frankfurter, Minneapolis; Henry Hutchinson, M. D., St. Paul; T. R. Huxley, M. D., Faribault. The association meets once a year.

MONTANA SANITARY ASSOCIATION.

Dr. T. J. Sullivan, Butte, *President;* Dr. R. E. Hathaway, Glendive, *Vice President;* Dr. Thomas D. Tuttle, Billings, *Secretary.*

NEW HAMPSHIRE ASSOCIATION OF BOARDS OF HEALTH.

Mr. Wm. K. Robbins, *President,* Manchester; Dr. Haven Palmer, *First Vice President,* Plymouth; Lemuel Pope, Jr., D. V. M., *Second Vice President,* Portsmouth; Dr. Irving A. Watson, *Secretary,* Concord; Dr. D. E. Sullivan, *Treasurer,* Concord.

NEW JERSEY SANITARY ASSOCIATION.

President, Norton L. Wilson, M. D., Elizabeth; *First Vice President,* H. M. Herbert, C. E., Bound Brook; *Second Vice President,* Gordon K. Dickinson, M. D., Jersey City; *Third Vice President,* John B. Duncklee, C. E., South Orange; *Chairman of the Executive Council,* William G. Schauffler, M. D., Lakewood; *Secretary,* James A. Exton, M. D., Arlington; *Treasurer,* George P. Olcott, C. E., East Orange.

NEW YORK.

An annual Sanitary Conference is held each year under the auspices of the State Health Department.

OHIO.

Joint meeting of state and local boards of health held in January of each year. President and Secretary of State Board of Health, *ex-officio,* officers.

ASSOCIATION OF EXECUTIVE HEALTH OFFICERS OF ONTARIO.

President, Dr. P. H. Bryce, Ottawa; *Vice President,* Dr. C. L. Campbell, London; *Secretary,* Dr. Chas. A. Hodgetts, Toronto; *Council,* Dr. Logie, Dr. Sinclair, Dr. McAlpine, Dr. Charteris, Dr. Skinner.

SOUTH CAROLINA SANITARY ASSOCIATION.

Dr. J. M. Reardon, Sumter, *President;* Dr. J. W. Folk, Georgetown, *Vice President;* Dr. J. Mercier Green, Charleston, *Secretary.*

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